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[For additional data on land use, see category 116, pp. 190-288.]

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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should be ascribed to the general wetness of the season rather than to these storms alone. A general picture of the damage can be obtained from the local press (24) but certain aspects, of interest to the hydrologist and agriculturalist alike, are worthy of elaboration here. The notes which follow are based largely on the experiences of the farmers themselves. 132*

There are some ways, perhaps, in which storms such as those of 11th-13th October, 1957, may be beneficial, in filling the rock-cut cisterns, in clearing debris from wied channels, in removing accumulated salts from irrigated land and in transporting soil from karstland on to the terraces below, but such benefits, affecting relatively few farmers, would be more than offset by damage to the crops and lands of a far greater number. 132* 241 731

Several types of damage can occur in times of torrential rain. Plants are damaged by direct impact, walls weakened by saturation of soil between the stones, clay masses slide downhill. Run-off causes sheet and gully erosion of the soil, washes away dams, walls and roadways and removes growing plants from the ground. In valley floors and low-lying areas, dams are silted up and water courses overflow to flood the more level land.

Fortunately, there were few standing crops to be damaged. The small part of the grape crop remaining to be picked was completely destroyed but cauliflowers and tomatoes were little affected. In many cases, however, sulla seed which had germinated was washed away and October was too late for re-planting. In some cases, vetches were sown as a replacement crop but, where the soil remained so wet as to prevent later ploughing, no crop could be raised until the following winter. Some farmers made fortuitous gains: one, near Kirkop, harvested more than nine hmiel of sulla from a vine field on to which seed had been washed. In the Wied tal-Pwales, melons, stored in the open were washed out to sea.

Farmers with flat land draining a large catchment area suffered severely from flooding. Very late tomatoes, grown to exploit improved marketing conditions, together with much of the autumn-sown potato crop were lost or severely damaged. This was particularly the case in Bur Marrad, where floodwaters stood for several weeks, and in the Wied tal-Pwales. Violent run-off caused extensive damage in several areas, despite the traditional careful terracing of steep slopes. Though sheet erosion in places removed an inch or more of the topsoil, the greatest damage was caused by gullying. Figure 17 illustrates one such case. The group of fields shown here lies on a natural terrace formed by the Upper Globigerina overlain with Blue Clay, above St. Paul's Bay. The damage to these fields is a product of the rain falling within them, since they stand on a spur and were not affected by run-off from higher areas. Similar damage occurred in other sample areas of steep slopes, clay soils and maximum storm rainfall; at Mgarr, Rabat and Wied ta'l-Isqof. Fields lying in the path of storm drainage suffered damage of a different type as shown in Fig. 18. Retaining walls built across a valley floor were swept away owing to the absence of any sort of drainage channel. Similar instances were noted at Mellieha, Mgarr, St. Paul's Bay and Mqabba.

The worst damage naturally occurred in areas where steep slopes coincided with maximum rainfall intensity, i.e. in north and west Malta. Four hundred farmers submitted damage claims, of which 262 were accepted as warranting financial assistance. The latter group included 10 per cent of all registered farmers in the parishes of Mell'eha, Mgarr, St. Paul's Bay and Rabat and just under 5 per cent. in Mosta and Gharghur. Damage in other parishes was not considered sufficient to merit assistance.

It would appear that, in many parts of the Islands, a day's rain amounting to 3 inches is almost certain to lead to damage of the kinds indicated and since such rainfall occurs, in one area or another, at least once in every five years, more efficient drainage would appear desirable. There are, however, several conflicting factors to be taken into account. In drier years, the farmer wishes to limit drainage so as to obtain maximum soil moisture at the beginning of the dry season, while the hydrologist wishes to encourage percolation into subterranean aquifers (see p. 43). At the same time, valley floors, where damage is 132* 311

[text continues on p. 69]

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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likely to result from rapid run-off, are highly desirable for cultivation in most years because of their deeper soils and longer-lasting water tables. [132* 311]

Statistical analysis suggests that storms of the type described must be accepted as recurrent and normal and provision made to counter their effects. Damage to crops and lands might be considered as part of the normal cost of better yields in other years, though this raises questions of profit and loss accounting which have not so far been faced. Similarly, the conflicting interests of agriculture and water supply, referred to elsewhere in this book, must somehow be reconciled. Such problems must be considered against the fullest possible background of factual data.

REGIONAL DISTRIBUTION OF RAINFALL

Two conclusions may be drawn from the foregoing analysis of storm rainfall, namely that there are marked regional variations in the distribution of rainfall from any one storm and that certain areas are more subject to storms than others. This would suggest that total precipitation might show a distinct regional pattern an idea borne out by analysis of records from a number of stations. Figure 19 is based on the Schools rain gauge records (Series H) and, although these cover a period of only 15 years, they accord well with the results of Agius's calculations based on records for a number of stations from 1901 to 1910.

Most of the Islands' rainfall is brought by north-westerly winds, the convectional effect being strengthened by orographic uplift along the steep north-western coasts of Malta and Gozo. The distributional pattern of Fig. 19 is a product of these factors. Maxima in Gozo of over 24 inches are recorded where the northern plateaux lie directly in the path of prevailing winds. In Comino and the extreme north of Malta there are indications of a slight rain-shadow effect. The upland areas south of Ghajn Tuffieha, together with the Naxxar-Gharghur Hills, give the highest rainfall amounts in Malta. In the lee of these hill masses distinct rain-shadow areas occur, with annual totals below 20 inches.

Valletta, lying in the drier, eastern part of Malta, had a mean annual rainfall of 21.94 inches for the period 1924-39. This is 1.4 inches or 7 per cent. greater than the average obtained from the 116-year record; thus the isohyetal values of Fig. 19 should be reduced by that amount to give a truer picture of long-term means.

DEWFALL

Dew is the only other form of precipitation to occur in the Maltese Islands but this has not been measured by modern methods. Zammit's figures (25) (Table 14) would appear to be much too high, presumably because his method involved the use of a metal collecting pan (26). [114]

Table 14. Zammit's measurements of Dewfall. Inches.

1854		1854		1854		1855	
April	0.75	July	0.81	October	0.79	January	0.24
May	0.62	August	0.30	November	0.34	February	0.56
June	1.12	September	0.78	December	0.16	March	0.08

Seasonal variations indicated by these figures are, however, reasonably reliable and it is interesting to note that 66 per cent. of Zammit's measured dewfall occurs in the period April-September inclusive, a seasonal rhythm similar to that observed by Duvdevani (27) on the Israeli littoral. The influence of dewfall on the growth of summer plants is obviously considerable and warrants investigation by more up-to-date methods.

thus of surface temperature regime. However, soil profiles show virtually no difference between different sites, and it is only in exceptionally wet locations that the normal pattern of aridity is sufficiently overcome to allow the development of noticeable humus horizons. 132 134

In the past there have been broad oscillations of climate responsible for the production at different times of widely differing soil materials such as the 'red soil' (red brown Terra clays), stoney calcareous debris and aeolian sands which are now the materials parent to the present soil. The present climate, however, is not a leaching climate.

This uniformly arid climate is in strong contrast with that of some other latitudes, for example, that of Britain, and suggests itself as the reason for the restricted range of soils found in Malta and Gozo.

PARENT MATERIAL

The rocks which are ancestors to the soils are all closely similar in type chemically, and only moderately variable in physical characteristics. Thus only a limited range of soil types is to be expected. However, the massive, well-jointed limestones have developed karst landscapes because they favour percolation and solution more than do the porous but nearly impervious finer-textured limestones. On the karstlands the red brown Terra clays have developed on almost completely de-calcified residues from the limestone, but on the other landscapes there has been a minimum of decalcification, and the soils are very like the rocks from which they have been formed. Thus, the composition of the impurities in the limestones from which they were originally weathered mainly decides the nature of the Terra soils (although inblown calcite has increased their calcium carbonate content). Similarly the texture and detailed composition of the carbonate raw soils and xerorendzinas is closely dependent on the parent material. The parent material type is therefore important for Maltese soils because it partly determines what pedological processes can take place and especially because the processes taking place now have little effect. 133 134

TOPOGRAPHY

Topography generally influences the development of the soil in a variety of ways, and chiefly through modifications of climate, variable conditions of drainage and effects on erosion and transportation processes. It has been noted that in Malta and Gozo the variations of topography produce sites with very different insolation conditions, but the effect on soil processes is negligible. It is only in the extremely freely-drained conditions of some hill tops, where lime crust yermas are simulated on parent materials of fine sandy loam texture that the effect of topography on drainage conditions can be thought to be sufficient to produce soil modifications. Flooding with sea water may be attributed to topography, and in the Alcol series at Salinas, for example, slight salinity is the result.

The effect of topography on erosion, transportation and deposition is more noticeable. Under former cooler climatic conditions, solifluction took place, and under the present conditions sheet or gully erosion occurs during the violent showers of late autumn. The result is that there are strikingly different eroded and alluvial phases of the same soil series in some locations. On the Blue Clay soils the alluvial, light clay type is more favourable to agriculture than the eroded heavy clay type which is in patches alkaline or saline-alkaline.

BIOLOGICAL INFLUENCES

Apart from man's activities, biotic factors are of relatively small importance in the soils. Humus horizons are only developed under well grown and long undisturbed vegetation, which is very rare. The organic-matter deficient humus forms of the surface horizons of the cultivated soils can only be seen easily under the microscope, and the soil fauna seems to be very limited in numbers. 134 311

The modifications of the soil pattern produced by man are, on the other hand most profound. Apart from the large area of Malta which has been covered by human habitations, factories, airfields and military installations, where the

134 soil has been bulldozed or covered up and is unrecognisable, the pattern of soils in the agricultural land has been changed.

311 Firstly, nearly all the land in Gozo and most of the land in Malta has been terraced, on slopes so steep that the terraces must be very narrow, with very high retaining walls. The backwalls of the terrace are often cut into the solid rock and the resulting rockflour mixed with the soil material, while the floor of the terrace is quarried and made flat and then covered with rubble before the soil material is replaced on it.

Terracing of this type is very widespread on the cultivated areas except on alluvial parent materials, and gives rise in the karst lands to a complex of soils described as 1-Iklin complex, ranging from carbonate raw soils to Terra-like soils, dependent on the amount of rockflour and rubble added to the original Terra soils during terracing.

Where quarries have been dug, the soil has been replaced in a similar way, with added rubble, refuse and rockflour in terraces which have been built up at several levels in the quarry. The resultant mixed soils have been referred to as tad-Dawl complex, which is rather similar to 1-Iklin.

The use of inorganic town refuse on the soils and the large-scale carting of soil material away from building sites to wherever it may be desired adds to the generally rather confused nature of many of the soils, and since about 0.1 per cent. of the total soil cover is moved every three years in this way, the scale is quite large.

To summarise, the pattern which man modified was dependent mainly on parent material, time and the ineffectiveness of the climate in producing soil horizon development. The effects of utilisation by man have produced widespread and profound modifications of that pattern.

Table 21. Classification of the soils of Malta and Gozo according to the system of Kubiena (1953).

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Division	Class	Type	Sub-type	Variety	Series
A. Sub-aqueous					
B. Semi-terrestrial	BD Salt soils		Secondary salt soils		
C. Terrestrial	CA Terrestrial raw soils	Syrosem	Carbonate Syrosem (Carbonate Raw Soil)		Fiddien Nadur Ramla San Lawrens
	CB Not represented in Malta				
	CC Rendsina-like soils	Rendsina	Xerorendsina		Aicol San Biagio tal-Barrani
	CD Not represented in Malta				
	CE Terrae Calxis	Terra	Terra fusca	Earthy terra fusca	tas-Sigra
			Terra rossa	Sialitic terra rossa	Xaghra
	CF CG CH CI CJ	Not represented in Malta			

The soil is usually reddish in colour because of the small admixture of red sesquioxide material, but this is sometimes missing and then the soil is greyish or slightly yellowish, while the other soil characteristics are unchanged. A variant found on the glauconitic facies of the Greensand covers only a few acres - a deep greenish buff loamy sand. 134

Sometimes the fields occupied by the Nadur Series contain fallen blocks of Coralline Limestone, and often they are very small and strongly terraced. Frequently they are abandoned, or devoted to flowers, but where in use, vines, and to a small extent, tree fruits are grown. [311]

RAMLA SERIES

Parent material and location: The Ramla soils are formed on sands of contemporary dunes at Ramla in Gozo and sands from the Quaternary dunesand bed at Armier in North Malta, where they are mostly man-made having been excavated from the dunesand bed. Where blown sands have been deposited, a sequence of parent materials giving a complex of soils (The Armier complex) of Xaghra and Ramla series and intermediate types is also found; on Qortin tan-Nadur in Gozo and on Marfa Ridge, south of Armier.

Description of a Ramla Series soil not recently cultivated:

0 - ¼"	Oat grass emerging from a very thin A.F. layer composed of a dense mat of decaying grass leaves.
¼ - 2"	Brown sand; single grain structure, grains 'strung' on abundant grass roots; no stones; dry.
7 - 14"	Brown sand; single grain structure; slightly moist.
14 - 40" plus	Strong brown sand; single grain structure; no stones; moist.

In agricultural use without a grass cover, these soils show even less horizon differentiation; they are almost completely uniform, except where they have been 'marled' with other soil materials.

These soils are generally terraced, but the fields are relatively large and the terrace walls are not high. [311]

FIDDIEN SERIES

Parent material and location: The Fiddien Series is mainly developed from well-weathered calcareous Blue Clay but a heavy clay soil is found on the relatively unweathered (calcareous) Blue Clay which is sometimes saline or alkaline. In both cases the topsoil may show an admixture of downwashed red clay and sandy materials from the soils upslope on the scarps in which the Blue Clay is mainly found.

Usually the unweathered Blue Clay is near the surface at the head of the scarp slope so that the heavy clay is upslope from the lighter clay. On the gentler slopes the light clay is extensive, and in total area far exceeds the heavy type. The differentiation is important since the heavy type is occasionally alkaline or saline alkaline, because of the nature of its parent material.

Description:

Medium or heavy clay type

0 - 10"	Olive clay (dry); moderately well developed fine to medium sub-angular blocky in large prisms; plastic and sticky.
10 - 30"	Olive clay (moist); massive; plastic and sticky.
30" plus	Dark blue green clay, unweathered. In field sloping 10 degrees with a 'slump-shoring' 4 feet high terrace wall at the front face.

Clay loam and light clay type

0 - 16"	Grey brown gritty clay loam; weakly developed fine granular structure; sticky, moderately plastic; numerous glauconite particles.
16 - 30"	Grey brown gritty clay loam; better developed granular structure in angular blocky compound peds; more compact.
30" plus	Grey brown gritty clay loam; well developed coarse prismatic structure. In flat field 40 yards across with a 3-feet drop at one wall.

The fields in which this soil is found are usually either unterraced or have minimal terracing as in the descriptions above. Frequently unterraced slopes [311]

[134] [311] of over 20 degrees which are worked can be seen, but at slopes over 30 degrees the soil development is very poor, there may be gullying and the land is unworked.

SAN LAWRENZ SERIES

Parent material and location: The soils of this series are related to those of the Fiddien having as parent material Blue Clay and Globigerina Limestone alluvium and colluvium overlying Globigerina rock. In the normal sequence of soils down a scarp slope the series lies below the Fiddien and above the San Biagio.

Description:

0 - 1"	Brown clay loam; small granular structure; slightly stony; dry, powdery and loose.
1 - 13"	Brown fine sandy clay loam; weak medium granular structure; some gravel; very friable and slightly moist.
13 - 40"	Olive brown fine sandy clay loam to clay; well developed fine angular blocky structure; compact; plastic and sticky; moist.
40" plus	Pale brown fine sandy clay loam to clay; weak medium granular structure; gravelly, mostly decaying Globigerina rock.

[311] The fields in which the series is found are usually terraced, and sometimes have tall rock-face cuts at the back. The terraces are seldom very narrow, while those of the San Biagio series often are.

XERORENDZINAS

According to Kubiena (1953), the xerorendzina, also called dry rendzina, is a 'rendzina, ash grey in colour, usually very loose, when dry in general very powdery, with extremely high chalk content often also of water soluble salts, particularly gypsum; occurring in dry regions'. This soil is very similar to the South Russian serosem or grey earth of the dry steppes.

General description: The xerorendzina has an AC profile. The grey, shallow, loose, calcareous A horison, with mull or mull-like rendzina moder humus form usually passes through a well developed whitish Ca horison into hard parent rock C. It is sometimes difficult to distinguish from a carbonate raw soil, differing in little but the humus form. In Malta and Gozo two series are classified as xerorendzinas, one of which is not typical but is most conveniently called by that name.

The organic matter content of the surface horison averaged over 2 per cent. in five samples from the San Biagio series, 1.7 per cent. in four samples of the Alcol series, but 3 per cent. in three samples of the tal-Barrani series rising to 6 per cent. in samples of uncultivated soil. The calcium carbonate content of these soils estimated from a small number of samples is 55 to 80 per cent. but some areas of the Alcol and tal-Barrani series probably contain less.

SAN BIAĠIO SERIES

Parent material and location: This soil is developed from the weathered Upper Globigerina Limestones, and intercalated thin beds of iron-rich and phosphatic nodules, that appear both in the tall scarps of Malta and Gozo and in relatively flat plateaux. Consequently the sites on which the soils are developed are quite varied, and eroded and alluvial-colluvial phases are as common as a normal phase.

Description:

Eroded phase

0 - 7"	Very pale brown, silt loam, some gravel; moderately well developed medium sub-angular blocky structure; sticky and slightly plastic.
7 - 10"	Pale brown slightly heavier silt loam; moderate fine angular blocky structure.
10" plus	Very pale brown, silty, soft laminated rock.

Alluvial-colluvial phase

Surface just dry after recent rain has a thin, cracking, alluvium crust. 134

0 - 10" Pale brown silt loam; weak medium sub-angular blocky to crumb structure; plastic, non-sticky.

10 - 28" Pale brown, slightly heavier silt loam; slightly compact; with almost massive structure.

28 - 72" Pale brown silty clay loam; massive.

The normal phase is between these two extremes in its characteristics, and is usually of the silt loam type.

The landscape appearance is very uniform, and the fields in which this soil is found are normally strongly terraced, with cut-rock faces at the back of the terraces, from which fresh rock flour is derived during ploughing and is incorporated in the soil. Many fields have been partly produced by 'mining' in this manner, and some patches of soil are still carbonate raw soils. For agriculture in the islands this series is probably one of the most important since it is very extensive, and widely used. 311 134

ALCOL SERIES

Parent material and location: The Alcol series is developed on the valley loams (Quaternary and Recent) which are partly alluvial and partly colluvial and occur in the broader valley bottoms. They are erosion products of Terra, rendzina and carbonate raw soils, they are often stratified and are generally, but not always, well sorted. In general the material parent to the present soil is deep and of heavy texture, but a few sandy types are found, and intercalated gravel or boulder horizons occur. The differentiation of the soil from the parent material is difficult, since there are no well developed horizons except those produced by tillage. 134

General description:

1. Uniform material

0 - 6" Pale brown fine sandy clay loam; large to medium crumb structure; loose; very dry; numerous worm casts.

6 - 21" Pale brown silty clay loam; weak medium sub-angular blocky structure; moist; worm casts found.

21 - 72" Pale brown clay loam, passing to brown silty clay; weak medium sub-angular blocky structure becoming larger with depth.

72" plus Dark yellowish brown, similar to above, but very wet and possibly partly gleyed.

2. Stratified material

0 - 13" Reddish brown silty clay loam; moderately well developed medium granular structure; some worm casts.

13 - 16" Strong brown fine sandy clay loam; structure becoming laminar.

16 - 21" Reddish yellow very fine sandy loam; weak medium laminar structure; some gravel and cobbles; slightly moist.

22 - 45" Reddish yellow very fine sandy loam with many boulders.

46 - 60" Clay loam; very fine to fine angular blocky structure.

In general the fields in which this soil appears, are flat and consequently unterraced. [311]

In some places at the coast a saline ground water table is producing symptoms of salinity in the soil, but more usually the soils are merely strongly calcareous, neither saline or alkaline.

TAL-BARRANI SERIES

The tal-Barrani soils appear to be transitional between the San Biagio and Xaghra soils. They are developed mainly on Globigerina rocks of massive appearance and texture similar to the Franka, on which they are also occasionally found. The soils have been much disturbed and mixed in the making of terraces, and some have been artificially produced by man, by mixing rock flour and Terra soil material. [311]

Description:

0 - 10" Brown gravelly silt loam; with a thin crust (in dry weather) and below, moderately well developed crumb structure.

10 - 18" Brown gravelly clay loam becoming more gravelly towards the

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base; weak fine sub-angular or angular blocky structure.

134 18-24" Brown gravelly loam or clay loam mixed with limestone rubble.
24" The formerly calcreted, broken surface of the Franka or similar rock.

[311] The fields in which the tal-Barrani soils are found are often strongly terraced, for example, in the dissected Globigerina Limestone Plateau of south east Malta.

The hill top fields are naturally relatively flat and unterraced, but often show evidence of profound alteration of the rock floor by man.

TERRA SOILS

The terra soils found in Malta are principally earthy terra fuscas, but soils similar to siallitic terra rossa have been found, and there are certainly forms transitional between these two varieties.

The Terrae Calxis to which group the Terra soils belong, are according to Kubiena (1953), 'very mature, extensively weathered usually completely chalk free soils with ochre yellow, ochre brown to red coloured (B) horizons which contain iron in the form of ferric hydroxide with varying water content...' Terra fuscas are 'usually humus deficient loamy soils with ochre yellow... to reddish brown colour on limestone rocks, which contain ferric hydroxide in the form of limonite', and earthy terra fusca is described as 'in the top soil, loose to slightly compacted, usually dark matt brown coloured terra fusca with good crumb structure'. The earthy terra fusca usually has an A(B)C profile, with a humus deficient, thin grey brown A horizon in which the humus form is generally mull. This horizon overlies a thicker reddish brown ferruginous (B) horizon which usually lies directly on the parent rock C horizon. The soil has a marked tendency to form crumbs and very low plasticity.

Terra rossa is described by Kubiena as a red soil, usually humus deficient and decalcified, rich in inorganic colloids containing ferric hydroxide in water deficient compounds, the siallitic terra rossa being 'Terra rossa with high colloid content, when wet highly plastic, viscous, characterised by a dense ground mass rich in silicic acid'. In general terms the profile is similar to that of the earthy terra fusca, but the soil colour is red and the plasticity is strikingly greater due to the different colloids. The structure is consequently different also, the peds being angular fragments produced by drying and shrinkage.

These soils have an organic matter content in the surface horizon of 4.5 per cent. (average of six samples) rather more in the case of uncultivated soils, rather less in the case of cultivated soils. This is slightly higher than the organic matter content of the tal-Barrani soils and very noticeably greater than that of the other xerorendzinas, and the carbonate raw soils. They are atypical of the variety in that they are not completely decalcified, containing in two profiles sampled 2 to 15 per cent. calcium carbonate, although much of the calcite in these soils has been blown in. This is emphasised by the greater calcium carbonate content in the surface horizons. (Two to four times greater than just above the rock.)

In the Maltese Islands the terra soils are found on the karst landscapes of the more massive limestones, that is the Upper and Lower Coralline Limestone and the Franka. The dominant variety is earthy terra fusca, and the mapping units used are described as such, ignoring the local transitions to terra rossa.

The terra soils can be divided into mapping units in various ways and it was found most convenient to map those appearing as patches between limestone lapiés as one group and the partly alluvial types in valley bottoms, dolines and on flat land without lapiés as another group. In the map (Fig. 27) they are not separated, but their agricultural potentialities are very different, because while in one case rock occupies from 10 to 50 per cent. of the surface and the rock slope may be steep, in the other case neither rock nor slope restricts the use of implements. In other respects they differ but little as can be seen from the descriptions below.

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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Soil between lapiés

Surface	A few limestone stones and an incomplete cover of xerophytic plants.
0 - ½"	Reddish brown gritty clay loam; moderately well developed medium crumb structure; hard.
½ - 24"	Reddish brown or dark red clay; well developed fine angular blocky structure; very dry and very hard.
24" plus	Hard, white, semi-crystalline limestone with a calcreted surface.

Soil from site without lapiés

Surface	Bare after cultivation, a few stones.
0 - 15"	Dark yellowish red clay loam; medium crumb structure moderately well developed; dry.
15 - 36"	Yellowish red clay; moderate to well developed fine sub-angular blocky structure.
36"	Hard white crystalline limestone.

By definition of the mapping units these soils exist in fields which are unterraced and are often unenclosed.

COMPLEXES

The mapping units so far described are relatively simple, in that although they are not completely uniform the variations in the soils encompassed by each unit are small. However much of Malta has been very intensively used by man for a long period, and in some localities the effects on the soil are most pronounced - as described earlier. In such places the complication of the soil pattern is considerable and the mapping unit used is the complex. This denotes a fixed relation between a number of soil series alternating too rapidly to be separately delineated. The two units used covered: (1) the lands which have been quarried, where soil has subsequently been replaced in terraces below ground level; (2) the terraced terra soils (mainly karst-land). Both complexes are produced on land which formerly was covered by terra soils, and soils which it is possible to classify as terra are usually found to be most extensive now. However, in the quarrying and in the production of terraces by cutting away limestone lapiés, much rock flour and broken stone was produced, and much refuse and 'imported' soil was used to make up the soil. Consequently carbonate raw soils are to be found in many terraces, simulating the Nadur series, and the terra soils contain much material that is never found in the untilled soils of similar type. Between these extremes, soils which simulate the tal-Barrani Series are also to be found, presumably produced by the mixing of some terra soil with a great deal of rock flour.

These complexes are therefore dominantly disturbed terra soils with added matter, with numerous enclaves of xerorendzinas and carbonate raw soils. The alternation of the soils is so rapid that frequently within one small terrace 25 yards long by 8 yards wide all three types will appear, and the intensive terracing or quarrying is the distinguishing feature of these mapping units.

PROPERTIES AND UTILISATION OF THE SOILS

The interpretation of chemical analyses of calcareous soils is not always very clear. For example, the methods used for extracting exchangeable cations sometimes result in the extraction of calcium from calcium carbonate as well as from the exchange complex. Similarly figures given for readily available phosphate are of uncertain meaning, because the extractant cannot exactly simulate the ability of the plant to take up phosphorus which may be fixed by calcium carbonate. The figures given in Table 22 are therefore to be considered as a comparative guide. (It is thought that in this table there has probably not been much overestimation of calcium in the exchange complex because the highest measured values are correlated with the lowest values of calcium carbonate.) There is some difficulty of comparison with soils from other countries since the same analytical methods are not always used. Soils from

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134 Spain, Sicily, Cyprus, Palestine and Australia of similar description, give roughly similar analyses, but it is not worthwhile to compare data obtained by methods of which the details are not closely standardised.

134 311 The carbonate raw soils have been divided into textural groups for convenience in describing properties and utilisation. The sands, loamy sands and sandy loams are very dry, easily worked, rapidly warming soils which where practicable, are mainly devoted to vines (Nadur series) and fruit trees (Nadur and Ramla series). Because of their light texture they have relatively low values for nutrients; however, they appear to give satisfactory crops, and are probably quite satisfactory. The clay loams and light clays (San Lawrenz and Fiddien series) are sticky, water retentive soils, usually fairly well structured, but hard and dry in late summer, and with a tendency towards an alkaline condition locally. In some parts of Malta they are used for a wide variety of crops, vines, tomatoes, cereals, and potatoes, but are more often devoted to sulla, as in Ġnejna Valley and western Gozo. The Fiddien heavy clay, potentially valuable because of its high clay content, is usually alkaline, sometimes slightly saline and often has very bad water relations, so that it remains little used.

The carbonate raw soils, with one or two localities excepted, are terraced, or stand in steep slopes, so that there is little prospect of increasing the field unit size. Of the xerorendzinas, the San Biagio sandy loams and silty loams and the tal-Barrani loams are only unterraced on plateaux tops, while the Alcol clay loams and clays are almost never terraced. It is among these xerorendzinas, together with the level tas-Sigra soils in the karst areas that there is a chance of increasing field size sufficiently to allow mechanisation.

The San Biagio and Alcol series are, moreover, among the more easily worked soils, but appear, with the highest active calcium carbonate, low exchangeable bases, low organic matter and higher pH, to be among the chemically less-favoured soils. Observations of potash necrosis and iron chlorosis were made mainly on these soils. However, the reasonably satisfactory structure, easy tillage, and reasonably good water relations of these soils appear to compensate, for the soils are universally cultivated and appear to give satisfactory crops. Both series appear to be used for a wide range of crops, cereals, vines, rootcrops and market garden crops generally, the last mentioned particularly on irrigated land.

The tal-Barrani loams and clay loams, which comprise the brown rendzina soils, are found almost entirely in the heavily populated area of southern Malta, where they are intensively used, and almost universally terraced. They appear to be entirely devoted, apart from odd fruit trees along walls, to annual crops, principally cereals and potatoes. From the table (22) their chemical characteristics appear more favourable than those of most of the soils, and their structure and tillage properties appear to be fairly satisfactory. It is not known, however, whether they are more productive than, for example, the nearby San Biagio xerorendzinas.

The clay loams and clays of the Terra soils are all, potentially at least, rather fertile, as is revealed by the high figures for exchangeable bases, the rather unusually satisfactory figure (in Terra soils) for total phosphate, the relatively high organic matter content, lower pH and low active $CaCO_3$. However, where they occur as small soil puddles between lapiés the mode of working is problematic, and they are generally rather dry, compact, and difficult to cultivate. Here they are usually left uncultivated, and used for birdcatching and very rough grazing for sheep and goats, or occasionally very patchily for poor crops of cereals, prickly pear, fruits or flowers. The alluvial flats and flatter lands without surface lapiés are by contrast, usually heavily cultivated, bearing a wide variety of crops, especially in the damper valley bottoms, with potatoes most important on the non-alluvial flatlands. Where the land is worked intensively the depth of crumb-structured soil is greater, and in the valley bottoms, especially, the water relations seem to be improved.

The terraced Terra soils, that is, members of the various complexes, are usually very dry, and one of the unfavourable features of the carbonate raw soils, is the higher active calcium carbonate because of the incorporated rock flour.

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

They seem to be largely devoted to cereals and potatoes, and in general give relatively poor crops. These soils are in several areas widely abandoned because they are uneconomic to work. 134 311

SOIL NEEDS

The needs of a soil, for the improvement of its fertility, are not simple to assess, and in the Maltese Islands at present they are not known. A fertile soil is considered as one which is in the optimum condition for the growth of crops, and this is dependent on a variety of factors, physical and biological as well as chemical. Air and water must be available, and man by cultivation and irrigation attempts to influence their disposition to favour his crops, just as by using fertilisers and weed or pest killers he attempts to influence the chemistry and biology of the soil.

PHYSICAL NEEDS

A soil which has a poor physical structure may be unable to support good crops, because water cannot be conducted to the plant easily enough, or because the soil aeration is poor. The heavy clay soils of the Fiddien series have poor structure, and it probably is the correlated difficulty of wetting the soil rather than the chemistry of the soil material (which often has a rather high concentration of exchangeable sodium and soluble salts) which causes it to be nearly useless for agriculture.

In the majority of cases the Maltese soils have a reasonably good structure, and the only other soils which appear to be ill-favoured are the heavy-textured soils of the Xaghra series. In this case the subsoil is often very compact indeed, and the separations between structural units are minimal. However, where such soils are well worked, and more particularly where they are irrigated, the structure seems to be much improved, partly no doubt because of the increased and active microfauna. While irrigation is probably difficult to extend, the use of improved cultural practices on these soils would probably produce an increase in the soil organic matter content and improvement of the structure. Among such practices the use of nitrogenous fertilisers, use of improved rotations, encouragement of root growth, avoidance of oxidation of root-derived organic matter through unnecessary turning over of the soil, and the avoidance of pulling cereals as a method of harvesting, might cause considerable improvement. The application of animal manure in irrigation water as already practised locally in Malta also appears to be effective in increasing organic matter content of the soil. 134 242

One of the chief problems of all crops in the Maltese Islands, is water. Certain of the lighter textured soils are extremely dry, and conservation of rainwater rather than extension of irrigation must be the answer because domestic water needs are already difficult to satisfy. Apart from practices designed to diminish evaporation loss, especially early removal of weeds by hoeing, it is probable that increasing the organic matter content would considerably increase the ability of the soil to hold water. But another simple possible method would be to marl some of the lighter soils with the calcareous clay, e.g. Fiddien heavy clay, which is not in agricultural use. (This would in addition possibly make more nutrients available.) 134 [312]

As far as aeration is concerned, it seems unlikely that it is deficient in many soils at present; but use of a rototiller (common in Malta) is believed to decrease aeration, and this could be investigated quite simply. It is possible that an excess of soil CO_2 would be beneficial in calcareous soils, reducing the pH of the soil solution to a level at which there is greater availability of most nutrients; and particularly those, such as phosphorus, which are likely to be deficient.

CHEMICAL NEEDS

Despite some other possible deficiencies it seems likely that nutrient

[TEXT CONTINUES ON P. 97]

1: Bowen-Jones et al. K-5 (1955-1958) 1961

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[p. 98-B]

Fig. 28 Steepness of Slope (Malta).

1: Bowen-Jones et al. K-5 (1955-1958) 1961

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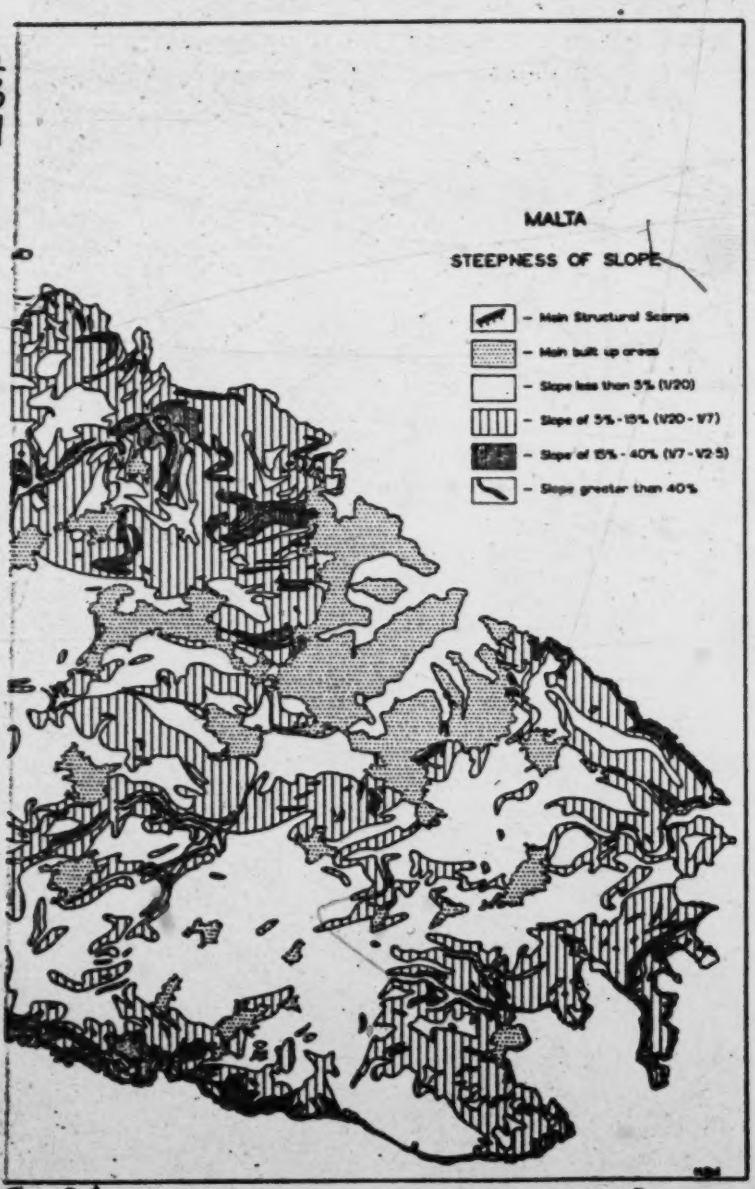

Fig. 28
Steepness of Slope (Malta).

[p. 98-C]

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

B. Slope Analysis, Erosion and Tillage

The slope map (Fig. 28) is a further illustration of the regional variations in the physical landscape which were described in some detail in Chapter I. The most clearly marked feature is the division into Western Scarplands and Central and Eastern Hills and Plains. In the former, gently sloping land (slopes less than 1 in 20) is confined to basins and to a few very limited parts of the plateau uplands. Sharply accidented topography and thus steep slopes are widely developed in this region, reflecting its complex structure. Slopes of gradients ranging from 1 in 7 to 1 in 2.5 occur along the faulted edges of all the plateau blocks as well as in the zone of Blue Clay outcrops which separates them from the Globigerina lands to the east. The various uplifted blocks themselves generally have undulating summits with slopes between 1 in 20 and 1 in 7. In the Central and Eastern Hills and Plains, the position is reversed. Over these parts of the Island gently sloping land (gradient less than 1 in 20) covers at least half the area and really steep slopes (greater than 1 in 7) are confined to coastal cliffs and a few valley incisions, the latter case being particularly widespread in the Naxxar-Gharghur hills.

There is, however, no simple correlation between steepness of slope and the presence or absence of cultivation. Indeed, the greater proportion of the land shown on the map as having a gradient greater than 1 in 7 is in fact still under the plough. The distribution of waste and abandoned land, occurring on plateau summit rather than scarp face, is a function of rock-type, exposure and various social and economic factors (see p. 227) rather than of gradient. That gradient only in extreme cases sets absolute limits to the extent of cultivation is illustrated by the Rdum zone of the south-west coast where, in the Rdum ta'Dingli and the Rdum tal-Lunzjata, intensive cultivation is maintained in land whose average gradient is greater than 1 in 2.5.

Though gradient has little direct effect on the pattern of farmland and waste, it obviously has much to do with the physical effort involved in maintaining a particular piece of land in cultivation. Even here, the control is by no means absolute. The problems of retaining a soil cover are much less serious in steeply sloping districts where thick, heavy soils are derived from the Blue Clay, than in areas of similar gradient where the parent rock is of Globigerina or Coralline Limestone. In the latter case, soils are thin and coarse, *'campi artificiale'* are frequently found and the soil, once removed, is not easily replaced either by natural or by human agencies.

The character of field boundaries illustrates this point. In Blue Clay areas they are generally low ramps rather than retaining walls, whereas in steeply sloping limestone areas, walls of great height and thickness are necessary to maintain a rudimentary soil cover. Field shape and size (see Fig. 68 and p.185) are also relevant. Long, narrow, ribbon-like fields are characteristic of steep slopes in limestone districts, while in Blue Clay areas fields are generally much larger, despite steep gradients.

The dangers consequent upon careless tillage and failure to maintain boundary walls are greatest on slopes steeper than 1 in 7, in areas where the soil cover is thin and is either artificial or derived from limestone rocks. The abandonment or neglect of a single field, the breaking down of a single wall quickly lead, in such areas, to damage above and below the neglected field and may eventually affect a whole flight of terraces, even driving away other cultivators who are unable to bear any increased load of maintenance work on their walls and fields. While outstandingly heavy storms can cause damage to land of all types (see p. 67), in areas falling within the category indicated above, constant vigilance is necessary at all times, both in the use of traditional methods of tillage and particularly in the introduction of new ones.

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1: Bowen-Jones et al. K-5 (1955-1958) 1961

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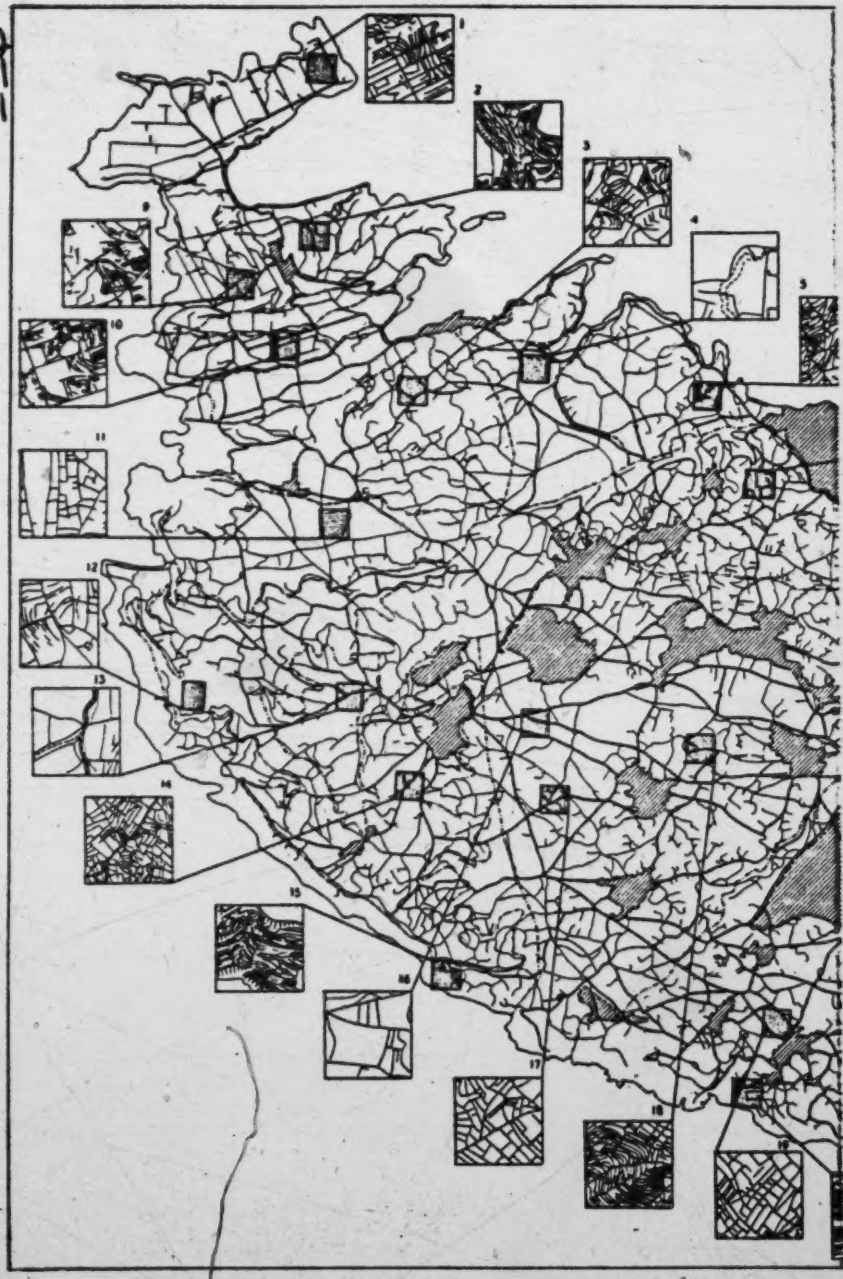

[p. 184-A]

Fig. 68 Communications and Field Patterns

1: Bowen-Jones et al. K-5 (1955-1958) 1961

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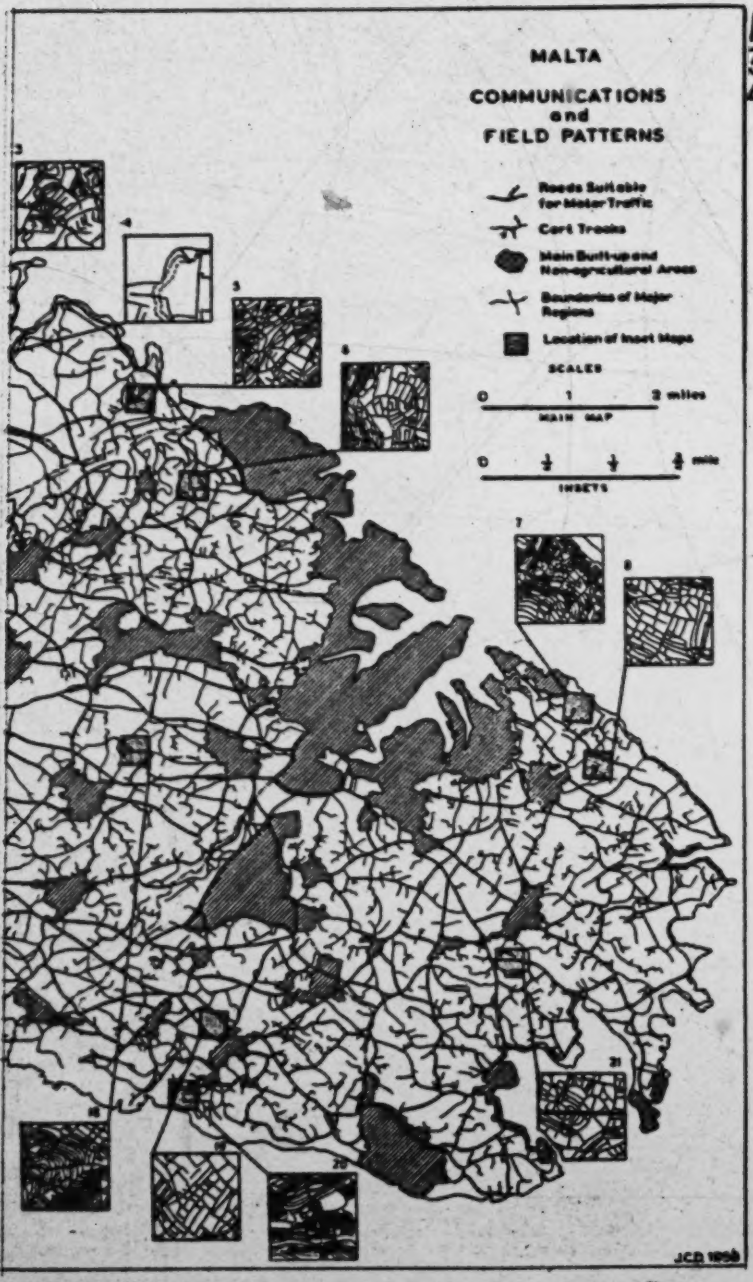

[p. 184-B]

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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D. Note on Fig. 68

COMMUNICATIONS AND FIELD PATTERNS

Roads, tracks, stone walls and buildings are the human imprint on the surface of the land and the first three of these elements are illustrated in Fig. 68. The pattern of communications, while at first appearing quite devoid of plan, nevertheless shows distinct regional characteristics. On the Coralline Uplands, where cultivated land is often scattered among stretches of karst, there are few motorable roads, but numerous tracks appear to wander at will across the surface. In the Marfa, Mellieha Ridge and Bajda Ridge districts, a grid-iron pattern of roads and tracks reflects mid-nineteenth century plans for the allocation of land.

Basins and lowlands such as Mikieb, Bingemma, Wied tal-Pwales, the Blue Clay Basin and Wied il-Ghasel, are characterised by an open network which includes several important roads and a minimum of linking tracks, an arrangement also characteristic of the central plains west of Żebbuġ and Siġġiewi. In these areas, the gentle slopes obviate the necessity for cart access to every field, while the absence of terraces does away with the need for well-defined, walled tracks. 'Service tracks' leading off the main lines, are virtually absent. This is in complete contrast with the state of affairs prevailing throughout the bulk of central, southern and eastern Malta, where roads and connecting tracks form a denser web between the numerous settlements and their lands. Here, 'cul-de-sac' service tracks abound and few fields are more than a quarter of a mile from one of them. There is a marked tendency for the network to become closer in regions where steep slopes are common as in the Naxxar-Gharghur hills and around the Wied il-Kbir complex.

The inset maps, each covering an area of one-ninth square mile, illustrate the great variety of field size, shape and arrangement to be found in Malta.

1. Marfa. The rectilinear nineteenth-century pattern has been superimposed on older patterns which show a clear relationship to topography.
2. Mellieha Upland - Wied Ghajn Żejtuna. The narrow terraces of the sharply sloping valley sides contrast with the rather larger fields of the valley floor and with the open karst of the upland.
3. Wardija Uplands. An irregular pattern developed on the Coralline plateau summit.
4. Wied il-Ghasel. Unusually large, open fields with only occasional walls. The wied channel (shown by broken lines) has been ploughed over.
5. Ghallis Hills. Small, irregular enclosures on the hill tops; larger, more regular fields in the small valley seen in the south-east.
6. Naxxar-Gharghur Hills. Large fields on the smooth hill summits; extremely narrow terraces on the sharply incised valley sides.
7. Ricasoli-Zonkor Ridge. Minute enclosures, the smallest in Malta, on the seaward side of the ridge.
8. Larger more regular fields on the southerly, inland slopes of the same ridge.
9. Mellieha Ridge. Fragments of an old, topographically-determined pattern remain, on which a few lines of more recent origin have been superimposed.
10. Bajda Ridge. A clear example of the superimposition already referred to.
11. Bingemma Basin. Large fields, often with a strip formation, are typical of down-faulted Upper Coralline basins.
12. Santi-Bingemma Uplands. Now almost entirely abandoned: the fragmentary character of the pattern is typical of such areas.
13. Blue Clay Basin, near Fiddien Bridge. Large, open fields.
14. Rabat-Dingli Uplands. A more intensively worked section of the Upper Coralline along the Rabat-Dingli road (shown by a double line). Contrast with number 12.
15. Western Rdum Lands. Part of the Rdum tal-Lunajata showing the minute subdivision typical of such areas.
16, 17, 18, illustrate variations within the central part of Malta. In example 16, the fields are particularly large. 17 shows greater subdivision, irregular in the north and approaching the rectilinear in the south. 18 illustrates the effects of steeper slopes, in this case on the southern side of the Wied is-Sewda.
19. A regular pattern on gentle slopes between Qrendi and Mqabba.
20. Minute terraces near the southern coast.
21. The effect of recent road building is illustrated here in the splitting up of no less than 14 fields, along a 600 yard stretch of road. In the process, a number of minute fields of little or no value have been formed.

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1: Bowen-Jones et al. K-5 (1955-1958) 1961
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INTRODUCTION

Contemporary agriculture can only be understood in terms of the whole nexus of environmental and human factors. Although a general truism this assertion continually needs to be emphasised in a study of Malta. In these Islands the observer will meet more puzzling features both major and minor in scale than it is conceivable would be found in any territory of similar size. The wider one's comparative experience, the more it appears necessary to discard general principles and to adopt a habit of querying the origin of every minor element in the landscape. The various problems are examined elsewhere but a brief statement of their type and range will serve to depict the complex nature of Maltese agriculture.

All visitors to Malta are invariably impressed by the vast extent of stone terrace walls which give to the ground-level observer an impression of rocky barrenness. The questions which arise, and which have not been satisfactorily answered, are manifold in their complexity. Do the terrace-walls merely serve to retain naturally-evolved soil and if so is the present density of enclosures strictly necessary? Are these walls, on the other hand, ramparts behind which man-made soil accumulations have been slowly built up to create artificial fields? If the latter, does normal pedological analysis provide a sufficient basis for soil husbandry? If the former, how far can enclosures be enlarged to permit a greater use of mechanised techniques?

The climate of Malta, as analysed in Chapter II, has some especial characteristics. How far do certain combinations of temperature, humidity and wind velocity in various topographic circumstances encourage the appearance and survival of the very many diseases and pests which afflict Maltese crops? To what extent may the climate-soil complex be held responsible for the virtual absence of the olive and the remarkable ignorance concerning viticulture which is only now being dispelled? Must the physical environment be regarded as the main reason for the fact that Maltese farmers have never produced important indigenous strains of crops or livestock but have relied entirely on breeds imported from their more productive neighbours?

Innumerable queries of this type result from even the most cursory visual survey, and any attempt to answer them brings in even more complex human questions. If the maintenance of man-made soil in artificial fields by arduous manual labour is essential for the ecological stability of many regions, how important is the conflict between the needs of production and the social desires of the cultivators? How far has poor husbandry been a product of rural isolation? How measurable is distance as it affects contact between producer and market, between village-dweller and *il-Belt*? None of these and other questions is uniquely applicable to Malta, but *in toto* they present such a formidable array as to make one feel that these small islands have concentrated within them certain microcosmic qualities.

In this Section are considered some of the observable facts tha. directly concern the use and potentialities of agricultural resources. The main features of the economy and society in general have been described in previous sections; the basic elements of the agricultural sector may be summarised as follows.

The total area of the Maltese Islands is some 280,512 *tmien* of which 152,343 *tmien* are cultivated (54 per cent of the total) (1). The relationship between Malta and Gozo in these respects is remarkably constant, both islands having a similar proportion of worked land, Malta possessing 79 per cent. of the total area and of the cultivated land. Of the 7,272 *tmien* of irrigated land, almost 89 per cent. is found in Malta where the only large irrigated zones also occur.

This cultivated land is worked in 12,315 registered farmholdings of which over 70 per cent. are in Malta. The rural community (i.e. persons living in dwellings registered as farms and including farmworkers' children and other members of the family otherwise employed) number 57,354 (72 per cent. in Malta), almost 18 per cent. of the total population. Of this rural community 34

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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and a small staff is still retained to endeavour to keep its material up to date.

Quite apart from the varying accuracy of the censuses (and it is almost impossible to assess the accuracy of the earlier ones), the analyst is faced with other internal problems. In connection with the size of farms and the types of land within them, different criteria have been used at different times: in 1891 and 1901, land was classed as cultivated and uncultivable; in the Farm Register, irrigated, semi-irrigated, dry- and tree-covered land are classed as cultivated and the balance as waste; the surveys of 1951-56 specify dry, irrigated and idle land, together with waste. How far these groups are comparable from period to period it is difficult to say. The 1956 Abstract provides a better picture, for here in addition to the analyses of dry and irrigated land considered separately, there is also a simple size analysis of holdings according to the amount of dry and irrigated land taken together. More closely comparable with the earlier analyses it is yet not identical, since wasteland and, presumably, idle land are omitted. The full significance of the size characteristics of Maltese farms emerges only when the relative proportions of the two classes of land, dry and irrigable, are studied. This material is presented later, in Table 38. However, useful preliminary points can be made on the basis of the earlier, simple size-range tabulations.

The size-range data are presented in Figs. 133 and 134 and relating to Malta and Gozo respectively; they are directly comparable except for the 1956 curve in the Gozo diagram which relates to cultivated land only. However it is unlikely that this discrepancy will seriously upset the validity of the diagram as a whole. A 1956 curve for Malta, based on similar figures, differs only in detail from that produced here for the period c. 1945.

The content of these diagrams is largely self-explanatory: each curve illustrating the number of holdings above or below certain critical size limits. In Malta, in the year 1891, almost 80 per cent. of all holdings were smaller than 40 *tmien*. Also in that year the median figure was 18 *tmien* (5 acres) in Malta but 13 *tmien* (3¼ acres) in Gozo. Farms were already smaller in both islands by 1901 and, at the end of World War II, Maltese farms had become smaller than were the farms of Gozo 55 years earlier. In 1906, the median figure for Gozo stood at the very low level of 8 *tmien* (2¼ acres). When it is realised that, for all except Gozo 1956, these data include some 5-7 per cent. uncultivated land, a major problem in Maltese agriculture has been outlined.

It might be held that the decrease in the size of holdings simply reflects a general reduction in the farmed area as a result of urban expansion. However, later evidence will show that the process of *morcellement* has probably been continuous for at least 100 years, and it is uncertain whether, over this longer period, there has been a net increase or decrease in the area of agricultural land. Certainly, in the period 1850-80 large areas of wasteland, mainly Government Land, were let on long improvement leases. Although it is clear that some of this land, for various reasons, never became productive, and yet more has remained marginal in character, a quantity unknown has been permanently added to the cultivated area of the island.

However, from Figs. 133 and 134, it is clear that the reduction in the average size of the farm has taken place at all levels: large farms have become two or more smaller farms, while smaller farms have been reduced in size. The process is thus an integral part of local agricultural development: small farm units are not merely the product of external encroachment, which, by reducing the area of agricultural land also reduces the average farm size (assuming a constant farm population). The extension of non-agricultural uses is obviously a factor to be considered, but the total farm population has not remained constant; indeed, despite considerable emigration and movement to the towns, it has increased (Chapter VIA). The precise number of holdings at any one time is not readily ascertainable, as most records are known to be incomplete and there is no means of knowing how many farmers failed to make returns. However, the following Table 34 indicates the general trend:-

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Table 36. Agricultural occupations - male and female.

Farmholders, farm-workers, and total workers on land (excluding sheep and goat herders).

		1842	1851	1861	1871	1881	1891	1901	1911	1921	1931
Farmholders	%	27.2	19.7	17.1	30.2	19.1	37.4	36.4	47.9	41.1	47.3
Farmworkers	%	71.9	78.4	80.9	68.1	79.5	61.4	60.4	51.4	56.9	51.1
Total workers on land	%	100	100	100	100	100	100	100	100	100	100
	000's	13.2	13.4	10.8	15.4	15.3	15.3	13.8	15.1	16.2	13.6

The general increase in the numbers of farmholders could have arisen entirely within the class itself, by the repeated re-allocation of land to succeeding and larger generations. Similarly the full decline in the numbers of farm-workers may be related to increased alternative employment or to emigration. However, case-study material seems to indicate that many families whose members had traditionally been landless labourers, working in fields, quarries or industry, as wages rose and fell began to acquire a direct interest in the land, thereby moving from one class to another without affecting the total agricultural labour force. Such a family history is examined in detail later in this chapter.

Another factor influencing the numerical increase and progressive reduction in size of holdings has been the long-term expansion of part-time farming. In this sector data is particularly limited and of dubious value. Table 37 consolidates all the relevant material.

Table 37.

	1891	1901		1956
'Farmers'	5,727	5,038	Full-time farmholders	4,706
'Part-time Farmers'	2,263	800	Part-time farmholders	5,337
			Other farmholders	1,368
Total	7,990	5,838	Total	11,411
Number of holdings	9,272	9,178	Number of holders	12,640

The discrepancies in the earlier two years between the numbers of farmholders and of farmholdings arise from the differing bases of the material, and because the number of holdings includes returns by the 'owners of fruit gardens and field labourers with very small amounts of land'. Similar explanations apply in 1956. These doubts notwithstanding, it is quite clear that a major part of the increase in holdings is made up of holdings farmed on a part-time basis; the number of farmholders principally dependent on agriculture having declined meanwhile.

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Earlier in this chapter, the point was made that most farms contain land of various types. Apart from virtually non-productive waste land, the main distinction is between dry land and irrigated land. The distinction is not always very clearly set between the two groups, since land can also be considered as 'semi-irrigated', as in the Farm Register. However, this type of land, watered from rain-filled cisterns perhaps twice or three times per season, cannot compare in output with the perennially irrigable land. The crops on this latter type of land will be watered at ten-day intervals for a period of six or more months. Semi-irrigated land is grouped by the farmers themselves with dry land as *raba baghli*, while perennially irrigated land they refer to as *raba saqwi*. So long as data is based on the agriculturalist's own criteria there seems little danger of confusion.

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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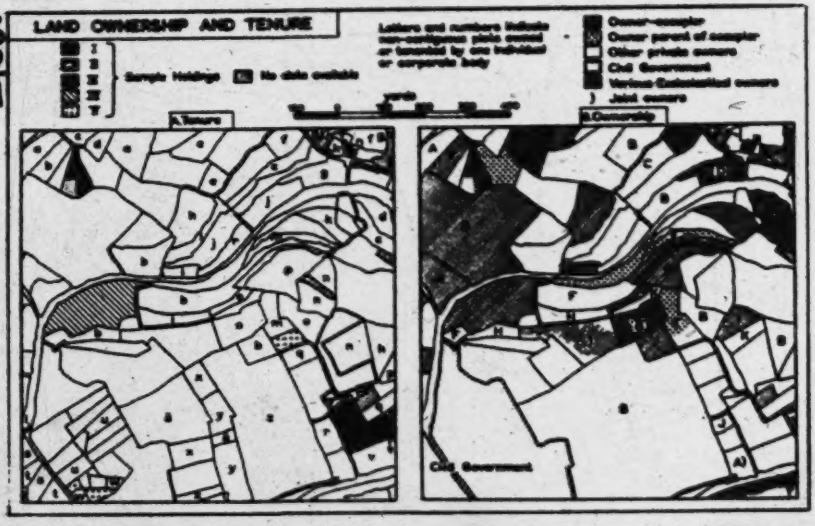

Fig. 135 Land Ownership and Tenure.

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From data supplied by the Central Office of Statistics, Table 38 has been produced. It shows the proportion of holdings, according to size range which contain only dry and only irrigated land, together with the proportion of holdings containing both; and on a simple areal basis, the predominance of each class of land within the mixed holdings. Table 38, as it stands, gives a valuable indication of the varied character of holdings. The great majority of holdings (83.5 per cent.) are seen to consist of dry land only. A very small proportion, less than half of 1 per cent., contain irrigated land only. The balance of 16 per cent. of all holdings are 'mixed'. The majority of these mixed holdings contain less than 5 *twien* of irrigated and less than 20 *twien* of dry land. It is clear that the additional productivity of the irrigated land will not affect a sufficiently large number of holdings, nor to a degree great enough, to upset the earlier conclusion that Maltese farms are extremely small.

The conclusions thus far drawn may now be summarised. Farm holdings of the Maltese Islands show wide variations in size, and their productivity is also very variable since farms consist of different classes of land held in varying proportions. Gozitan farms are smaller than those of the larger island, but everywhere the numbers of large and medium sized farms have been greatly reduced during the past 70 and probably 100 years; the residual holdings are mainly small. Encroachment on farmland by the expanding urban areas, roads and military installations may have been compensated in some degree over the long period by the development of former wastelands. *Morcellement* has been a characteristic internal process affecting the agricultural sector. It appears to have arisen partly through the sub-division of holdings amongst successive generations, but also through the acquisition of land by former landless families. Increasing, but uncertain urban employment has encouraged the growth of much part-time farming, which practice has in turn, contributed to the overall pattern of small holdings.

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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Table 38. Percentage of all holdings according to the amount of dry and/or irrigated land occupied.

Maltese Islands 1956.

Horizontally: quantity of dry land held.

Vertically: quantity of irrigated land held	Tm.	0	10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100	Total
	0	+	51.66	18.63	7.29	3.25	1.50	0.71	0.30	0.11	0.05	0.03	-	83.53
	5	0.31	4.83	4.26	1.75	0.97	0.39	0.21	0.08	0.02	0.04	-	0.01	12.83
	5- 9	0.11	0.56	0.78	0.55	0.28	0.09	0.08	0.04	0.01	0.02	-	0.01	2.53
	10-14	0.04	0.17	0.16	0.16	0.10	0.04	0.03	0.01	-	-	-	-	0.69
	15-19	0.02	0.06	0.07	0.03	0.01	0.01	0.01	-	-	-	-	-	0.20
	20-24	0.02	0.02	0.02	0.03	0.04	-	-	0.01	-	-	-	-	0.14
	25-29	-	0.03	-	-	-	-	-	-	-	-	-	-	0.03
	30-34	-	-	0.01	0.02	0.01	-	-	-	-	-	-	-	0.03
	35	-	0.02	-	0.01	-	-	-	-	-	-	-	-	0.03
	Total	0.49	57.35	23.92	9.85	4.64	2.02	1.02	0.43	0.14	0.10	0.03	0.02	100.00

100% = 12,552 holdings.

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1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

This small agricultural entity, the Maltese Farm, is further split into a number of non-contiguous plots or parcels, each of no great size. In illustration of this and other related points a small area in Malta, square in shape with a side half a mile long, has been examined in some detail (Fig. 135). The area lies in the Central Region, between Siġġiewi and Żebbuġ, and includes in its north-eastern corner, part of the latter settlement. It is dissected by two steep-sided valleys, that of the Wied il-Beqqiegħa crossing from south-west to north-east, and the Wied il-Ħesri which appears in the south-east corner. Narrow, terraced fields follow the contours of the valley sides but, on the more rounded relief of the interfluve, the fields, although still terraced, become generally larger and more nearly square in shape. Apart from the valley-floors, used as foot- and cart-ways, with other accommodation roads and paths, non-agricultural lands are limited to a few house-sites in the outskirts of Żebbuġ. A few scattered patches of rock outcrop occur on the steeper slopes, but the only large patch of uncultivated land covers the north-eastern lobe of the large tenancy plot lying south of the area shaded black in map. The remaining land is devoted to dry farming crops characteristic of the region.

LAND TENURE (Fig. 135A)

The underlying topography, clearly influences the shape, and, to a lesser extent the size of the tenurial plots. This is most striking in the north-eastern quadrant, where long, narrow plots reflect the sinuous terraces of the Wied il-Beqqiegħa; on the slopes of the Wied il-Ħesri, however, the relationship is scarcely apparent. Shallower gradients are covered by plots of fuller and more varied shape differing greatly in size. In the north-east corner small and oddly shaped tenancy parcels are clearly related to the nearby settlements and are mainly specialised garden plots. An anomalous area of small plots in the opposite corner breaks up the general tendency of increasing size away from the casal.

Tenancy units are small in size, but there is enormous variation. The average of the parcels shown here, including parts of parcels beyond the limits of the area mapped, is slightly less than 5 *tmien*. The smallest garden plot (*b*, north-east corner) contains about one-twentieth of a *tmien* of land, while the large plot of fieldland in the south (*z*) is about 50 *tmien* in extent. There may be a tendency for plots to be larger in areas where soils are thin and poor, but the two distributions can certainly not be equated.

Of the 129 plots, parts of which lie within the half mile square, 57 are held by farmers with no other land in the area. But the remaining 29 holdings each have two or more non-contiguous parcels. This relationship is indicated by the use of distinctive shading in the case of Sample Holdings II and V, and otherwise by the letter *a* to *z* and *d*. Holding *b* (six plots) scattered throughout the northern two-thirds of the area is an extreme example of the typical parcellation.

LAND OWNERSHIP (Fig. 135B)

In general terms, within the area shown here, the distributions of ownership and of tenure are similar. As shown in Fig. 135B, there are many scattered plots belonging to the same owner, a characteristic which might be termed fragmented ownership. A similar cartographical convention to that used in Fig. 135A is adopted here. Plots owned by the same private owner are indicated by the letters A-J (I is excluded); the numbers 1-4 are used similarly for the various classes of ecclesiastical ownership. All plots, whether duplicated or not, belonging to the latter class, which includes monastic, episcopal, and parish land, as well as land owned by Charitable Institutions (a very small proportion in this area), are distinguished by a special system of shading as also are Civil Government lands. The rather special cases of ownership by the occupier or by his parent are also distinguished from the bulk of the parcels which are owned by other private persons.

Looking at the distribution in its basic form, as a simple pattern of parcels, ignoring the various special relationships, several points emerge. As in the map of tenure, there is a complex network, but the weave is generally coarser,

1:Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

Fig. 137 Improved Government Tenement on Emphyteutical Lease of 99 years.

*423
102
311

[p. 302-A]

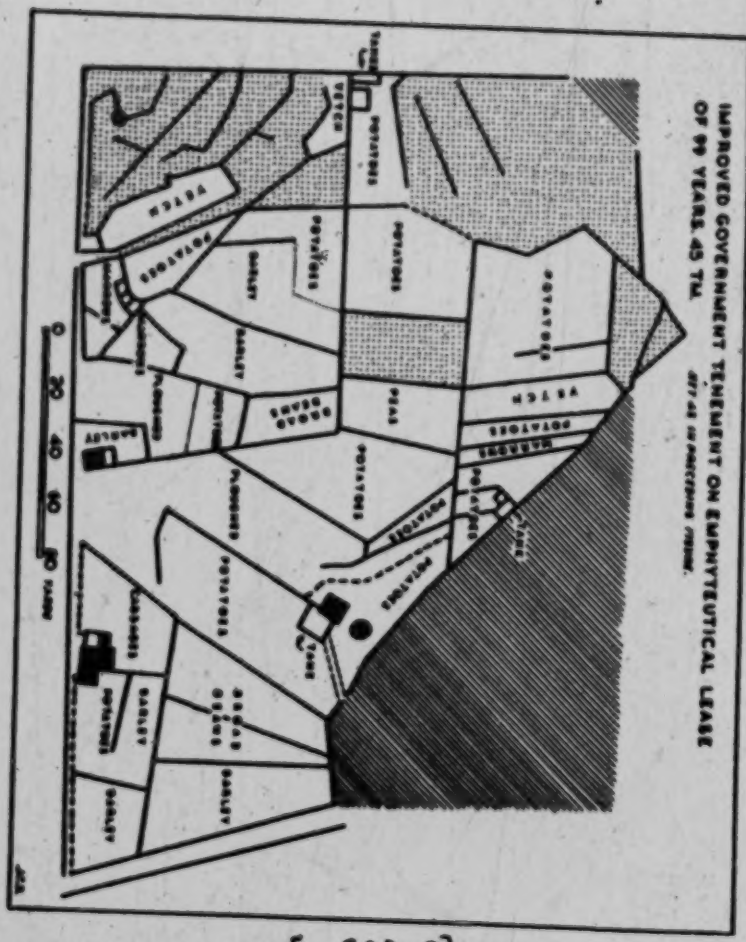

Fig. 138 Improved Government Tenement on Emphyteutical Lease of 99 years (second example).

423*
102
311

[p. 302-B]

[For key see page 302-A]

1: Bowen-Jones et al. K-5 (1955-1958) 1961
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Table 41. Estimated percentages of total agricultural land owned by various groups, c. 1950. 423*

	Civil Govt.	War Depts.	Church, etc.	Landlord	Farmer's Family	Farmer	Total
Malta	16	1	22	51	2	8	100
Gozo	23		12	54	2	9	100
Both Islands	19		19	52	2	8	100

be properly worked. This argument as a basis for encouraging owner-occupance must be treated with some suspicion. All the field evidence goes to show that, in recent years, land purchases by working farmers have been mainly of good and, if possible, irrigated land. The Maltese agriculturalist rarely makes a conscious assessment of his returns in terms of productivity of labour or capital but rather the emphasis is placed on gross production. Nevertheless, general productivity, security of harvest and even social status all make him buy the best land, even at inflated prices. Little of such freehold property is difficult to work and little of it therefore lies 'waste'.

Historically there is further proof that the incentive of ownership is on its own of no great importance in increasing the proportion of worked land in any holding. Early nineteenth century writers both commented on the large areas of rock and other wasteland in the North of Malta, and on the age-old practice of building 'artificial fields' (see p. 324). There was a widespread belief that the whole of the cultivated land had been created in this way and that further extension was mainly a matter of encouraging the farmers to undertake the labour involved. A Commission of the *Società Economico Agraria* considered the question and made in their report of 1848 (3) the following points. First, any increase in agricultural production, particularly of grains, would be welcome. Secondly, there existed a pool of grossly under-employed labour and capital. Thirdly, although the physical extension of the cultivated area would be a slow process, the national advantage would be great. Fourthly, this end could be achieved by the granting of land in perpetual emphyteusis so that capital and labour could be securely applied to reclamation. In 1855 Schembri supported such a policy (4). 423* 311 654

From 1850 onwards, much barren Crown land was distributed on this basis, frequently in parcels of 16 *tmien* and on 99-year emphyteutical leases. Subject to improvement (a clause that does not appear to have been enforced), the tenant had complete security of a tenure which could be renewed by his heirs on a preferential basis at low rents. During the first period rents could be as low as 1½d. per *tomna*.

Although some land was improved, the project as a whole was not a great success. Economic and social changes can be held responsible for some of the lack of response to these offers, for the second half of the nineteenth century was a dynamic period. In spite of much Crown expenditure on the laying out and construction of access roads, and the building of many field and terrace walls, some land was never taken up and more remained economically marginal. Of the leased land, a considerable proportion was later abandoned.

The main factor making for local success or failure of the scheme was the availability or otherwise of water. Two contrasting examples illustrate this point. Fig. 137 shows an area of 16 *tmien* in the hands of one tenant. Small patches of vetch are the sole evidence of use. Figs and vines planted during early development no longer bear fruit. This long-lease land is virtually waste. The other example, illustrated in Fig. 138, has similar terrain and is more exposed to wind and seaspray. Here the presence of a shallow water-body has provided an incentive for the slow development of a soil cover and enabled intensive cultivation to succeed. Twenty-two heirs of the original lessee have each insisted on their right to work a portion of the holding. 423* 102 311 654

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

*423 654 These are extreme cases but everywhere it is true that during the last century, continuity of tenure has not been enough in itself to produce land improvement.

*423 427 A variety of forms of tenure exists in the Islands. Emphyteutical leases, which must be documented, are legally all such that extend for a term longer than 16 years and have the proper content and conditions. On Crown land a period of 99 years has been favoured, but leases of 30 and 60 years are also found. The essence of such leases lies in their emphasis on tenant improvement of the land and on compensation for premature dispossession. Some of the implications of the official encouragement of emphyteusis have already been examined. In general the system is based on the supposition that the lease is long enough to reward the tenant for his development work, and that the land has been improved to a level at which short-term leases - first offered to the emphyteuta's heirs - become feasible.

Other leases are generally based on a four-year rotational cycle, in its turn based on the duration of the effects of intensive manuring on 'dry' land. Entry is normally on 16th August, in the 'dead' period of the year, and the most popular lease is for a duration of eight years with an option for renewal for a further similar term. On expiration the land is usually held on a yearly basis until a new satisfactory settlement is reached. Provisions for repairs usually divide responsibility between tenant and landlord on the basis of the scale of work and capital needed, the tenant being always responsible for wells and cisterns. Water derived from the holding should only be used thereon but in practice this is ignored. Regulation of husbandry is rarely mentioned except in general terms. Unless specifically revoked, legal provision exists for the remission of rents in the event of naturally caused crop-failure, although we have no knowledge of such a claim being made in recent years. After the flood damage of the autumn of 1957, the appeals were solely for Governmental aid.

The problem of compensation for improvement or for dispossession has in Malta as in other countries given rise to much disputation. Unless agreed by the landlord, any improvements to short-leased land can only be indirectly recovered either by removing impermanent fixtures or by the incoming tenant paying for items such as recent manuring or tillage. In the latter case, both parties regard the transaction in the light of a hand-over charge rather than as formal compensation.

Before 1940, the short-lease tenant had little legal security of continuity of tenure. On the termination of a lease the sitting tenant had preferential rights to renewal only if he were prepared to accept conditions equally or more onerous than would other applicants, provided the courts held these conditions to be reasonable. Such preference was negated if the land was needed by an owner or cousin or nearer relation of the owner. Theoretically, therefore, the ability of the tenant-farmer to resist rent increases or to prevent loss of investment was very limited. Wartime Emergency Regulations resulted in the creation of a special Board to consider problems of tenure where leases were shorter than for 16 years. Since that time preferential rights of renewal have been extended to cover immediate relations of a deceased tenant or to the equivalent of 'copyholders'. Rent increases must not be based on any increase in value accruing from any type of improvement, and their reasonableness is adjudged by comparable neighbouring rents. Greater freedom was afforded in sub-letting to a co-tenant or relation while the landlord's personal or family claim on land has now to be justified on the basis of a minimum four year use.

*423 311 427 The combination of short leases and absence of compensation for improvement has been held at one time or another to be responsible for virtually all the ills and defects of Maltese farming from a reluctance to plant tree-crops to the poorness of many local track and access roads. As with the relationship between freehold tenure and intensity of land use, such arguments are not fundamentally valid. Where physical economic conditions provide incentive to investment and improvement then the cultivator generally responds, no matter

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

what type of lease. However, many of the minor variations in land use which exist as between adjacent fields or parts of fields can be partially explained on the basis of their legal position. Thus the wasteland of il-Wilga in the Wied tal-Pwales reflects both physical deterioration and a tenurial conflict. But, as may be observed throughout the regional and distributional studies in this volume, the patterns observable in Maltese farming are resultants of many forces and influences, in which the legal element plays a very minor part.

A third type of tenure, that of share-cropping, appears in some rather specialised forms in the Maltese Islands. Between land-owner and occupier, its main incidence seems to be as a working arrangement between aged parents and their children. Between coevals it appears as a temporary form of sub-letting known as *bin nofs*. Some of the factors influencing the first type have already been examined. In the second case, share-cropping arrangements are a consequence of the growing tendency of farmers to leave the land for short trial periods to seek other employment or to emigrate. As a form of insurance, leased or owned land is then often let temporarily to relatives or friends on the understanding that should the farmer return, his land reverts to him or in the case of the time-limit (usually five years) elapsing before his return, the share-cropper takes over full rights. Although this is of doubtful legality in the case of rented land, landlords do not seem to object. In the north and west of Malta, over 6 per cent. of the cultivated area is held in this way, and the proportion is over 3 per cent. in Gozo. In other areas, share-cropping would seem to be of negligible importance. Because this system appears to be based on expediency, the details of owner-cropper relationship are more variable than in areas where *metayage* is more fully developed as an institution. The provision of land, materials and labour and the division of product vary greatly. One case exists of a whole community working the land under a tenant-in-chief who provides land, seed, manure and some machinery and then claims one-fifth of the value of the crops which he buys back in bulk.

The share-cropping tenures terminate with the death of either party. In all other cases the death of a tenant results in the leasehold becoming part of his divisible estate and liable to fragmentation between the children, all of whom have equal rights of inheritance. The importance of this element in the process of *parcellement* has been regarded as very great, in Malta as elsewhere. Before considering an actual case-study of holding evolution, it is as well to note some of the general points.

First, the family group has strong powers to maintain its hold on land and to exclude others from it. In this they are supported by the action of landlords and by the legal codes as at present framed. On the other hand, little effort is made to prevent sub-division within the family group. Thus no analysis of the process of fragmentation can be made without a full understanding of the nature of the Maltese rural family.

In this chapter, the main elements in the physical and legal entity which constitutes the Maltese farm have been considered. As much as is feasible of the legal and customary background to the farm unit has been considered. In illustration of these points and in order to amplify them, a detailed analysis of the lands of one Maltese family follows. It is appropriate here to record the great kindness, forbearance and co-operation shown by the members of that family without whose considerable assistance such an examination could not have been made.

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[P.317]

Chapter X

THE PRACTICE OF FARMING

We have considered at some length the physical and social environments in which Maltese farming exists, the distribution of crops and of agricultural regions, and examined some of the physical and legal characteristics of the land holdings in which the land is worked. There follows a more systematic statement and a tentative interpretation of farming practice, and studies of the Maltese countryfolk (Plate XVIII).

A. Livestock

Livestock in Malta, with the exception of the wandering, wasteland-feeding, herds of sheep and goats, is rarely seen or heard. Cattle, pigs, poultry and rabbits are all kept in stockyards or enclosures, and horses, mules and donkeys, when not working in the fields, are stabled the whole time. Their near invisibility has caused us to omit mention of them in earlier sections. As noted in Chapter VII, the Maltese farmer, faced with land shortage as a result of the high population density, has chosen to cultivate stall-fed fodders as short-rotation crops rather than to grow pastures or perennial forages. It is difficult to believe that he has not made the correct choice if the criterion adopted is that of intensive and continual use of difficult land resources and the minimising of waste.

Numerically, goats are by far the most important (Plate XVII). During the past century, they increased tenfold in number, a fact which marks the amazingly rapid increase in milk consumption, but in the last decade the trend has been reversed. The indigenous breeds, highly regarded in the Mediterranean up to the close of the eighteenth century, have now almost entirely been replaced by crosses with introduced British Saanen types. These crosses, in which Saanen blood remains dominant to the third or fourth generation, are hardy and prolific milkers, considering the quality of feed. Goats have remained important not only because they still supply about 40 per cent. of returned milk sales (and a large amount produced domestically and sold illegally), but also because, together with sheep, they utilise the great extent of wasteland as natural pasture. Some feeding on field grown forages is practised - during the survey such feeding was observed at Marnisi on broad beans and at Wied Babu on sulla, for example - but this is rare.

Land unusable for cultivation, and which makes up over 30 per cent. of the total area, provides the basic forage ration. Breeders and kids are given supplementary feeds of beans and hay crops. Although, therefore, goats are theoretically poor converters of fodder into milk, they cannot be displaced by milch cows without at once offending the tastes of most Maltese for goats' milk and cheese, and making the uncultivable land almost totally unproductive. Sheep, somewhat less numerous than pigs, and by far less valuable, occupy the same ecological niche as do goats. Used domestically in many areas for milking, and by far the cheapest meat animals, these predominantly hairy rather than woolled sheep, of a strong German strain, are one of the 'crops' of the barren lands. In the absence of statistics of fodder consumption, the only evidence available is that obtained in interview. It would certainly seem that sheep and goats use much uncultivated land in their demand for feed, and are almost the only media for obtaining any yield at all from one-third of the land of Malta and Gozo. (See also Chapter X C.)

Pigs, numerically the most important meat animals, are almost all of recently introduced breeds, the English Large White in particular, Berkshire, Wessex Saddleback and Middle White have been tried, but the Large White Yorkshire, even when bred for lean meat to an average weight of 180 lb., has

[See page 366 -- ANALYST]

for wind breaks, covered forcing beds, crop supports, etc. Livestock harness is simple in type consisting of head harness and collar. Working bullocks, now rarely used, are also equipped with collars for traction but the guiding reins are attached to the horns. Country carts are unsprung, wooden frames resting directly on the metal axles. That the ruggedness of their construction is only equalled by the toughness of the draught animals is evinced by their presence on places such as Dingli Undercliff, or the cliffsides of the Wied il-Luq (Buskett).

The solidly built stone huts or *orfa* that are to be found on most holdings may be regarded as part of the farmers' 'equipment' rather than his habitation. The simplest and most numerous are simple one-roomed cubes, some five yards square, strongly constructed, usually of worked stone blocks with wood and *torba* roofs. These 'blockhouses', for such they appear, serve as storehouses for implements and crops, for guns and birdcatching equipment, as well as for shelter during the 'siesta' hours and bad weather. Their cost in construction labour, and the pride that does into the simple furnishing of what is the farmers 'den', as well as the deceptive appearance of dispersed settlement that they give, suggests that further investigation into their origins might prove valuable. In general terms, they seem to be a natural response to the marked concentration of settlement in the casals. They are far less numerous in the western region of more recent and dispersed settlement. The larger, two-roomed and two-storied types are used mainly as summer working residences, when a whole family may move out of its casal to the main holding.

These implements and types of equipment are one facet of the complex of traditional cultivation techniques - techniques based on the intense and continuous application of uncosted hand labour. A brief examination of the working characteristics of some of the implements is a necessary introduction to a discussion of general cultivation techniques.

The *moħriet* (Plate XIX) is used as an animal-drawn hoe rather than as a plough proper. It is light and can be carried by the cultivator along narrow field paths and across rugged terrain. Its negotiability is limited only by the ease of access demanded by the draught animals. The 'rotavator' (Plate XX) alone of modern mechanical implements can rival it in this respect. On coarse soils, often only a few inches deep, cross tilling by hoe or *ard* seems perfectly satisfactory for tilth making. A vertically applied tool such as the true spade cannot be utilised in such soils, while all but the simplest mouldboard ploughs are too clumsy for use in small terraced fields. Both *ard* and hoe are used in garden rather than field style and their only disadvantages lie in the slowness of the work performed. Here lies the especial advantage of the rotavator that can, under reasonable conditions, be used for tilling six *tmien* of land a day as compared with about two or three for the *ard* and one for the hoe. (Figures are necessarily approximate averages.)

Cultivation techniques and the farming landscapes which they have produced are now in a critical stage of development. For millennia, a slowly increasing population has been utilising the natural land resources more and more intensively and also supplementing them by artificial works. Until the early nineteenth century, social and tenurial obstructions to full land use on the one hand, and wealth derived from the overseas possessions of the Knights of Malta on the other, little affected the basic land hunger of the rural community. During the period of British occupation, however, externally derived income has brought with it more and more non-agricultural activity. Opportunities for non-farm work have increased and so has socio-economic dissatisfaction with arduous and limited rural life. The stage has now been reached at which land reclamation and land abandonment, intensification of effort and neglect, are proceeding simultaneously. An examination of those landscape features which are products of farming techniques suggests that this stage is now critical.

Land reclamation and the extension of the cultivable area are still going on. At several points on the Delimara peninsula, material is being carried from the cliff foot and from old huts and dwellings and spread over the existing thin and discontinuous soil cover. On this, sulla as a soil building leguminous crop

[see page 306 -- ANALYST]

is then sown. Much of the resultant poor crop is hoed in, and then the humus enrichened tilth ploughed and put under rotational farming. At ta'Denfila, on the Upper Coralline tablelands, terrace walls are constructed from the larger boulders, and soil garnered from crevices and hollows then packed along and above the new walls. Fruit trees are planted in this new soil zone so that root development will both hold the soil and accelerate disintegration of the underlying rock. Stones are cleared from the remaining area, the rock floor chipped away, and leguminous crops such as broad beans are sown. When chemical weathering has sufficiently deepened the thin soils, and the humus content has been increased then normal ploughing is introduced.

On a smaller scale may be observed the building up by hand of 'perched' fields which, as at the Wied Buqana (103)* north east of Mtarfa, may stand 6 or 8 feet above neighbouring fields and which, with their red soils, contrast markedly with the surrounding white and yellow lands. Here, the material is derived both from Wied Qlejgha silt and from town refuse. Not only in these areas but in many others as around the Wied il-Hallelin in the Southlands, on the interfluves of the Wieds Dalam (274) and Has-Saptan (285), and near Armier Bay (6) in the north-west, this age-old land making can still be observed. Less important but still practised, as near il-Marnisi (275), is the process of chipping small fields out of the solid rock, and the slow conversion of inorganic aggregates, capable only of hydroponic use, into real soil. (A European analogue can be found in Spanish Galicia.)

Distinct from these creative processes, are the techniques of laboriously utilising to the maximum the existing natural resources. First there is the practice of using soil pockets and crevices which for the most part would be quite uneconomic to work on any commercial evaluation of effort. On all the Upper Coralline lands small pockets of weathered material - Terra Rossa - lying between great rock platforms and boulders are remarkably well utilised. Barley, peas and broad beans are typical crops as at Xaghra tal-Buskett. At il-Wejdar peas are sown in karst crevices and give surprisingly good yields. Larger clefts and pockets are usually used for tree crops. Carefully tended peach trees may be observed in a 4-feet wide and 14-feet deep landslip cleft on the Upper Coralline cliff south of the School Mater Admirabilis (Rabat). On the Victoria Lines Scarp at Targa Gap (95) a solitary lemon tree can be seen, carefully sheltered by cane fences in a small soil pocket surrounded by a great area of karst.

These are minutiae, but they illustrate the high intensity of resource use. Larger depressions in the Upper Coralline as at Hofret ir-Rizz (73) (Fig. 111C) have been given special attention. Here, irrigated crops are intensively grown in the deep soils of what is mainly a shallow solution hollow cum collapsed cavern. Dry wied basins having subsoil water as at the eastern Wied Musa (Fig. 102A) form oases in barren karstland. On a still larger scale there are basins such as that of ta'Saliba (34) (measuring about 400 yards by 800 yards) in which dry and irrigated cultivated lands are inextricably intermingled with small karst hills.

A different type of utilisation is that which notes and takes advantage of minor differences in environment. Where wied channels are wet and marshy for most of the year, as in the Upper Wied ta'l-Isqof (128) and in lower Wied Has-Saptan (285) then canes, bullrushes and sward grasses are encouraged, tended, and cropped. Where, on the other hand, wied channels are wider and less well watered, then cultivation has spread down from the neighbouring terraces. Protection from storm-water is obtained by the building of longitudinal protective walls in the channel itself as in parts of the Wied is-Serda (194) and the Wied ta'San Martin, and Wied ta'Ghajn Rihana (42). Occasionally, as in the Wied tal-Qlejgha (99), a further lower water channel has been artificially cut in the wied rock floor for extra protection.

Most of the storm water dams and soil traps are carefully sited at nick points in the long profiles. Examples of this conservation work may be found at

*A number in brackets following a place name refers to Figs. 69 and 70.

[See pp. 192 and 194--Analyst]

242 the heads of Wied Babu (219) and in the Santi Gap (57) in Malta and in the West-
311 Central Region of Gozo. In such topographical pockets, the building of soil trap walls is sometimes extended to form walled orchards as at id-Dahla and the head of the Wied ir Rum.

241 When we turn to observation and consideration of cultivation reactions to
311 minor topographical and geological features we are further reminded of the special relationship between tillage techniques and the soil. Bearing in mind the points noted in Chapter III B and the picture we have drawn of the physical and social environment in which Maltese agriculture has developed, we are forced to the following conclusions.

The economic necessity for the utilisation of virtually all land resources and indeed for creating some of them, together with the physical need for basing all farming practice on soil and water conservation techniques, have until very recently rigidly controlled the details of tillage. Fragmentation, a perfectly rational response to circumstances, has intensified the physical sub-division of the land. The majority of fields in Malta and Gozo cannot easily be worked except by small highly mobile implements. In the conditions described above and in a climate which makes possible a great crop range, implements must also be capable of a great diversity of application. In order to keep up the terraces, work the fields and succeed in maintaining and even increasing the area of cultivable land, the cultivator has been committed to unremitting and arduous manual labour. His basic tool is the hoe, his natural development of it the non-soil-inverting *ard*-plough.

The recent removal, by the creation of new real and psychological opportunities, of part of the pressure that has long kept the farmers on the land has altered the traditional picture. Cartographic evidence of the 25-inch to the mile maps, surveyed in the 1880's and 1890's, shows that since that time little waste-land has been improved. The only known large-scale change in field patterns occurred during and after World War II in the central lowlands of Gozo as the result of airfield construction, but holding fragmentation has re-imposed sub-division on the landscape. Occupational statistics and case-study evidence all point the same way. As a result of this release of pressure, land neglect and abandonment are now irregularly removing the extremes of control of cultivation. Even more important, Malta has been affected by the new evaluation of tillage techniques which has characterised so much of the world. Under modern conditions, most improvements in cultivation techniques have been deliberately designed for the increase of productivity on the better and more easily worked lands. Rural depopulation of the hard lands which gained such momentum in nineteenth-century Europe is an inevitable concomitant of such increases in productivity and of the accompanying demands for higher standards of material consumption and an 'easier' life. In countries such as Malta, this means that a new equilibrium has to be established, existing and new techniques and implements have to be evaluated against established environments and actual or potential changes.

241 Three examples from case-studies (Key letters refer to Chapter X E) can
311 illustrate what this means in farmer's terms. The first (A. p. 337) concerns a
435 part-time farmer in Region A II, Mellieha Isthmus. This cultivator corroborated other evidence that in the nineteenth century it was still common for 'dry' fields to be created out of wasteland. More recently it has only been economic to make irrigable fields. The method is virtually the same in either case. First a terrace
[242] is cut into the rock slope, and the stone rubble is then built outwards in 'made-ground' and held in place by a terrace wall. Soil, usually now from a building site, is then laid over the rock platform and stone infill. Such a field 2 *tmien* in extent in 1961 cost £150 in construction (almost entirely in labour) plus £50
[434] for the transport of 20 truckloads of soil. The gross receipts from this irrigated *campe artificiale* were £60 and £35 respectively for the first two seasons. A generation previously, such work would have been done more slowly by full-time farmers who themselves would have garnered the soil, but the market for irrigated vegetables would have been smaller. A generation hence, a cultivator will add to the costs of construction all the at present uncosted labour expended

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

by himself and will think of net profit on his sales rather than of gross receipts.

The second example is from a case-study (J. p.342') of a full-time mixed farmer holding 33 *tmien* of dry land (three blocks of six field plots) in Region C XX a, the Mqabba-Kirkop Plain. During the last 20 years, this farmer has built up a herd of 13 Maltese Friesian cattle including ten milch cows from a flock of six goats. Before World War II he relied on crop-sales from arable land. Now approximately half the cultivated area is given over to fodder production. Although by Maltese standards this farmer is enterprising, knowledgeable and possessed of much more than average capital, he has no mechanised equipment for tillage but relies on contract work. Each year a tractor plough and rotary cultivator are hired at a cost of between 15s. and £1 per *tomna*. The farmer still differentiates very clearly between the quality of different parts of his land, on the basis of a soil depth which varies from 8 inches to 2 feet, and on soil type distinguished by colour. Nevertheless, since he is now only really interested in livestock, and regards even fodder production as uneconomic, he has lost interest in arable farming and tends to neglect the poorer land and think of disposing of the other. This man is typical of many of the better class farmers in that the old niceties of tillage are forgotten as commercial considerations predominate, these latter a resultant of social and economic change in the Islands.

Lastly we may consider the extreme development, the farmer turned machine contractor. Only half the age of the farmers already considered, this man is much more aware of general developments in the agricultural scene, partly as a result of seven years spent as an 'emigrant' in Australia. Patrimonial land is left to the attention of other members of the family, and he is only concerned with investment in machinery for hire. This contractor now possesses a lorry, a Ferguson hydraulic lift tractor, a hydraulic shovel, triple-disc and mould-board ploughs, a rotavator as well as numerous accessories, and wants to purchase a thresher and a small combine harvester. The whole cultivation emphasis is put on mechanical effort and its ease of application. Deep-ploughing is advocated wherever possible even though he admits 'there may be drawbacks'; no qualms are felt about knocking down walls to gain admittance to fields, and considerable impatience shown towards traditional agrarian and social values. This man even complained that he was not allowed to plough on Sundays. One of his ambitions is the quintessence of the new attitude towards cultivation. It is to have a farm of 30-40 *tmien*, all in one block with no patch smaller than about an acre, the whole to be workable by tractor, thus making hand labour unnecessary, and accessible to heavy machinery. The holding should have its own farmhouse and be near to a market such as Żabbar. In this man the mechanical revolution in cultivation in Malta is epitomised, contrasting strangely with an attitude met at Rabat that the wheelbarrow is too technically revolutionary to be acceptable - 'it is not used here!'

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

SECTION IV Chapter XI

An Assessment of the Cultural Landscape

In this book we have attempted to portray the Maltese Islands 'in the round'. Deficiencies and omissions occur; the former unfortunate, the latter equally unfortunate but also deliberate because of space limitations. Nevertheless, we believe that our study, such as it is, has illustrated certain points of value. First, and this is a geographical truism, the relationship between man and the land on which he lives is infinitely complex. In the case of Malta this relationship is also astoundingly complete and coherent, so that alteration in any one part may provoke repercussions on all the rest. Hence, under these circumstances, change of any kind should be introduced with extreme caution; it has been demonstrated that lines of action which seem apparently well-found and reasonable at the time of inception can have wholly unforeseen and unintentional consequences. This warning has a general as well as local validity. Further, and in the light of this situation, it becomes essential to have as full a knowledge as possible of local conditions before undertaking action. Such knowledge can only be acquired through observation, which must be as complete and detailed as financial resources allow.

Thirdly, investigation of the use man makes of his surroundings leads to the conclusion that, in a last analysis, it is not the actual physical conditions which control man's activities - it is the view that man himself takes of what can or cannot be done which really matters. From the physical standpoint Malta is a highly typical Mediterranean country, yet we still do not know why the vine and the olive, these most characteristic plants, have hitherto only made temporary invasions of Malta. We do however know that the factors behind this were not physical - e.g. climate or to do with soil. It would thus seem to be the way man actually estimates the physical potentialities of his home region that governs what takes place - put in another way, we may say that environment finally exists only in the minds of men. In such a form it can appear intractable, offering insuperable obstacles, and mysterious in its effects. Hence, resource use should not be thought of solely as a routine controlled by physical media, but as a process in which temperament and attitudes of mind are involved. Recognition of the human factor as indissolubly associated with the physical elements of geography underlies our approach: and it is in this sense that our subtitle 'Background to Development' should be interpreted.

Lastly, there is an opportunity to draw together some of the threads which we have unravelled from the general weave, and summarise the main themes.

The principal conclusion is that everything one sees in Malta, other than the major topographical features, is man-made and man-maintained in existence. For this reason there is an unstable equilibrium that eternally threatens to collapse.

Physical environment is fundamentally harsh. The component rocks consist almost entirely of fissured and fractured Tertiary calcareous series, mostly of Miocene age; and natural accumulation of relatively insoluble inorganic soil aggregates is very slow everywhere except on the narrow outcrops of the Blue Clays. There is complete absence of surface water and subsurface moisture is small. Only in the western half of the Island do non-saline water-tables now rise near to ground level over appreciable areas, and only in one restricted area in the east - at Marsa - has this been even historically important. Malta has a highly accidented topography. The western half of the Island is heavily faulted and forms a region of scarpland and faulted basins. The eastern area has more subdued relief particularly in its central and eastern parts, but even here the legacy of gorge formation - the dry wieds of Malta - during the humid late Pleistocene, and the small scale erosional etching of all major and minor geological and structural junctions have resulted in there being very little land of low gradient.

132 The Maltese climate is characterised by variability rather than by extremes. Most of the complex elemental combinations, as far as we can tell at the moment, tend to inhibit soil and plant development under natural conditions.

The annual precipitation average of 20.5 inches is largely meaningless - the variations from one year to another for each month in which there has been recorded any significant rainfall are all several times the mean values. Very high insolation and evaporation rates, from the end of April to the beginning of October, further reduce the effectiveness of scanty and variable precipitation. Much of the rainfall of spring and autumn is associated with violent frontal storms and is sufficiently concentrated in incidence to produce ephemeral torrents and cause considerable erosion.

Wind incidence is of peculiar importance. The maritime air streams are generally of high humidity and velocity. The dominant Northerlies, in particular the stormy *Majjistral*, with high humidity and relatively low temperatures, have a biological effect bleak enough to produce a very clear ecological pattern controlled by aspect and shelter. The soil line in the lee of the ridges which lie transverse to these North to West winds, rises higher to the south east with the cumulative sheltering effect. On a small scale, windbreaks of stones, wattle hurdles and even cereal hedges, become of importance. The *Xlokk* comes as a warm humid wind of usually sufficient velocity to force plant transpiration rates above the critical points. The occasional humid still air conditions in winter delay germination and encourage fungus diseases while all summer winds heighten evaporation rates and cause actual soil blowing.

One of the few biologically favourable climatic features is the absence of a thermal dormant season. Mean monthly temperatures are consistently above 50° Fahrenheit, frosts are very rare, and diurnal ranges small. On the other hand, the associated high summer temperatures even though ameliorated by sea breezes produce considerable physiological troubles in plants and livestock. It is significant that over 80 per cent. of the flora now found in Malta are of North African rather than European type.

133 In the absence of human interference Malta must have been, as it still is in many areas, largely a barren karstic waste relieved only by a few basins and plains such as the Wied tal-Pwales and the Wied il-Ghasel. On the hill and ridge tops Terra Rossa formation takes place in solution hollows. On all slopes with gradients greater than 5 per cent., and on all but the most wind sheltered flatlands corrasion and movement, often exposing great stretches of bare rock, are dominant. Only in a few basins, such as the erosional Wied ta'Mazza or the tectonic Bur Marrad in the Wied il-Ghasel, does deposition become important.

In this harsh environment man created the land on which he could live.

134 Malta has few true soils but, rather, laboriously garnered and transported
311 inorganic material, carefully built up with humic additions, terraced and walled into place and irrigated wherever possible. For millennia this making of *'campi artificiale'* has gone on and may still be observed, so that some two-thirds of what Bernard Shaw called 'a heap of stones' is now cultivable land. This process of the extension first of hydroponics and then of true farming over bare rock and the reclamation of unhealthy lowland has meant the creation of new and precarious balances. The artificially produced thin pseudo-soil is not self perpetuating. The underlying rock must be regularly chipped away, the solution hollows periodically harvested. The texture must be maintained by the addition of organic matter and by frequent working. The level of nutrients must be kept up with dung and fertilisers and the water content supplemented by irrigation. The terrace walls need constant repair.

In each case there is a sharply critical point beyond which action spells danger. The use of refuse brings bacterial and virus infections, frequent tillage produces a clean surface vulnerable to erosion, the use of irrigation water and artificial fertilisers raises soil salinity. Extension of the soil cover decreases the rate of percolation replenishment of the subterranean aquifers by rain water. Malta is now in fact living on capital as far as water is concerned.

241 There have been similar critical points in crop values. When water is available, the potential crop range is large - bananas grow in barley patches, date-

1: Bowen-Jones et al. K-5 (1955-1958) 1961
EZ6 Malta EZ6

palms and pomegranates alongside potatoes - but in no case are conditions optimal or yields very good. In the comparatively closed economies of the past this mattered little; in an era of world trade and world markets Malta has now been left behind. Large-scale cotton production has virtually ceased and that of citrus fruit is declining; viticulture is of low standard and the olive tree very rare. Cereals can now provide only a tiny fraction of local needs while fodder production is limited in season and type by water shortage.

The critical phase in the social and economic reactions to the physical situation has also been reached. In the simple peasant communities of the past, the creative manual effort was necessarily associated with a low valuation of individual human effort and an arduous and restricted life. Now, however, economic and social opportunities and desires have widened and with them has come impatience with the demands imposed by the artificial landscape.

Higher per capita productivity to assure more freedom and leisure is only quickly attainable by technical and mechanical innovation. It is just such innovation that is impossible on a large scale on the land of Malta.

The slope analysis map (Fig. 28) illustrates one aspect of the problem. Maltese soil 12 inches deep needs, as a minimum amount, terracing at horizontal intervals of about 20 feet. Anything wider in the way of fields or a deeper soil makes essential increasingly higher and stronger retaining walls. The problem is such that considerable control is exercised by dip as well as gradient. The amount of labour involved in maintenance is heartbreaking by modern standards and yet, without it, erosion is quickly followed by the complete stripping away of the soil down to bare rock. The scale of farming operations often has to be very small - the planting of single rows of beans, of single trees, the sowing of chick-peas in rock crevices. Power and tool application is severely restricted. Small and light implements and single draught animals or more recently 'excavators' alone can negotiate this type of terrain and work very thin soils covering rock platforms. The dangerous effect of the abandonment of any land is obvious. The past has in fact enchained the present. If cultivation is to continue then in order to preserve the artificial ecological balance, created with such effort over the centuries, a social imbalance will become even stronger. Whatever the scale of farming the farmer will always have to grub for soil, build his terraces, carry his plough or manhandle his rotavator for long hours under conditions that will seem less attractive even than those of casual dockside and urban labour.

The first point then is that the landscape indicates how human effort is pinned down by the artificial environment and how restive man is becoming.

The second theme is concerned with the reasons for the historical process of what really amounts to landscape gardening, and with the underlying implications.

Malta's wealth, in historical times at least, has come from a large extra-territorially derived income which has resulted from the Island's positional value. It is possible that even in prehistoric times Malta was never self-sufficient. The great temple building cultures of Malta and Gozo may well have maintained their master masons on imported wealth. Certainly Carthaginians, Romans, Byzantines, Arabs and Normans all occupied Malta because of its strategic position and took wealth in rather than removed it. The Order of St. John held it as an outpost of Christendom maintained by the Knights' possessions on the European mainland. Britain has similarly supported the Island's economy in return for its use as a naval, military and more recently a strategic air centre. Because of Malta's positional importance its inhabitants found it necessary and worth while to create agricultural resources. Because Malta has usually been an outpost the society and its works have attained the unstable equilibrium of a siege life.

At least since Arab occupation a duality has appeared in the community. Earliest at Mdina, later in the Three Cities, then in Valletta and the whole Grand Harbour complex, and now around the naval, military and air bases, the garrisons have formed successive nuclei of a cosmopolitan and sophisticated community. This community, literate, trained in the professions and trades has

1 A [See pp. 98-B and 98-C -- Analyst]

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2: Boissevain E-5 (1960-1961) 1965
EZ6 Malta EZ6

[P2]

MALTA AND GOZO

361 Mellieha (1841), Mgarr (1898) and St. Paul's Bay (1905).
175 In Gozo seven new parishes appeared in just over a century:
103 Ghajnsielem[19] (1855), Qala (1872), Kerbem (1885), San Lawrenz (1893), Fontana (part of Victoria, 1911), Ghasri (1921), and Munxar (1957; v. Sannat, Map 1).

17 In the period reviewed the major development has been
361 the emergence of Valletta and the Three Cities under the
369 Order and the tremendous urban extension in the nineteenth and twentieth centuries. The town-villages of medieval Malta, looking inwards to Rabat, grew quietly but were eclipsed by the youthful Valletta and remained agriculturally and socially isolated. In recent generations the economic 'draw' of the towns and the harbour area penetrated the Fringe zone and then the Rural districts, bringing all the countryside in some measure within the economic sphere of the towns. This has been accompanied by the education and emancipation of the rural community which tends to blur the line of demarcation between townsman and villager. Thus an adequate definition of 'Rural Malta' becomes increasingly elusive.

SECTION 2:- The Farmer and Farming

128

DEFINITIONS

In much the same way in which the terms 'rural community' and village' need examination before they can be used in socio-economic analysis, so too, in Malta, do the meanings of 'farmer', 'farm-holding', etc., even as used in official reports, need elucidation.

128 The definitions of such terms made by Mitchell (B/525)
241 have been accepted by the present writer. The 'farmer' is
423 the "owner or holder of the land which he cultivates either
[114] individually or as the principal person of an agricultural enterprise". "The land worked by the farmer and his group of helpers constitutes the 'farm holding' or 'farm'. 'Holding' here implies simply the land held by the farmer, and is not used in a synonomous sense with the legalistic 'tenement'. There are excellent reasons for maintaining a clear distinction between the two terms for, on the one hand, a holding may consist of many different tenements held by the farmer of as many landowners and, on the other, a legal tenement may be occupied by more than one farmer.
311 Confusion may also arise, in this connection, from the fact
423 that a holding may contain freehold as well as various types of leasehold land". Mitchell continues "Most farms include land of more than one category, and especially in the north

311 and west of Malta and the hard rock areas of Gozo many
423 farmers hold rights over waste-land which from the cultivators' point of view is useless". As to size "the range is enormous" but "it is clear that a reduction in the average size of the farms has taken place at all levels". Today "the great majority of holdings (83.5%) are seen to consist of dry land only. A very small proportion, less than half of one per cent, contain irrigated land only. The balance of 16% of all holdings are 'mixed'. The majority of the mixed holdings contain less than 5 tmien of irrigated and less than 20 tmien of dry land".

423 The past hundred years have shown "a general upward
178 trend in the number of land-holders balancing a downward trend in the number of farm workers", while a "factor influencing the numerical increase and progressive reduction in size of holdings has been the long-term expansion of part-time farming".

This picture is made even more complex by the prevailing systems of land tenure and their wide ramifications. This sector has been investigated by Mitchell (B/525). He considers the various types of ownership (Government, Church, private ownership and owner occupation) and the systems of tenure (long and short lease and share cropping, etc.), and traces the land-holding history of one family back through four generations, in order to reveal the way in which the farm-holdings of the members of the various branches of the family have been assembled as the individual farmers have lived and built up their holdings and then dispersed upon death or retirement (in B/337). "Both the methods of acquiring new land and subdividing land already held are seen to result in more scattered and smaller plots".

311 Thus the Maltese farm is characterized by variety of
423 size, tenure, composition and soil types. Moreover, one must distinguish holdings which are primarily livestock supporting, from those essentially arable in emphasis and also from the heterogeneous class which might be called
[128] 'mixed farms'. The present discussion attempts to consider the Maltese farmer as an individual within the agricultural and rural scene and aims to demonstrate the contrasts between the illiterate and the educated, the old-fashioned and the modern, the prosperous and the poor.

THE PROBLEM.

128 This Section considers the dilemma of the Maltese farm today from the point of view of its technical management. The problem soon emerges essentially as the struggle by an uneconomic unit - the Maltese farm - for existence in the already unbalanced total Maltese economy.

000 already unbalanced total Maltese economy.

241 423 The first aspect of the problem is apparent from the points of definition just made. This is the complex of features which have produced the present landscape of tiny field-plots covering the cultivable parts of the Islands with a patch-work of small farms, each consisting of widely scattered pieces of good, bad or indifferent land. The farmer whose lands form one block is very much the exception.

[433] Yet although the number of constituent plots is often large the average area of the Maltese farm is very small ("Over 55% of the total number of holdings appear to have less than 9 tmien of cultivable land"; B/164 - 1957, p. x) and in many cases is patently insufficient to supply food for the family concerned as well as produce a surplus of crops or fodder (Case V).

241 311 464 The obvious solution of acquiring more land is not always possible, as illustrated by Case V where present and new building severely limits the extent of cultivable land in the vicinity. Moreover much land is going out of cultivation because the hand work required to maintain it is not forthcoming under the current wage/labour conditions. Many fields were built on inaccessible or barren patches of rock in days when manual labour was readily available and cheap, much of it unpaid family labour. Terrace walls were constructed expertly and soil tediously carted, levelled, tilled and irrigated. But while mechanization, particularly

[409] in the form of now popular small rotary cultivators, is enabling a smaller labour force to cope with more work over much of the Islands, some of these man-made fields defy even this kind of development on account of their small size, tortuous shape or inaccessibility. The terrace walls are neglected. A sudden storm removes a wall section and the soil which it held in place collapses over the terraces below and into the 'wied' bottom whence, in associated flash floods, it may be swept seawards.

423 241 454 The tenurial aspects mentioned (B/525) complicate this picture since they make for further divisions in an already minutely parcellated lay-out. Moreover a farmer is frequently deterred from making improvements on a pie e of land if he lacks security of tenure (Case IX): he concentrates any capital outlay on the patches of ground which he either owns himself or has on long lease and which show the necessary conditions of size, accessibility, irrigability (Case XI); or which provide suitable sites for building (Case I).

241 423 Part-time farmers are an increasingly important feature. They neglect or relinquish unprofitable land even more

Pawlu's holding at Easter, 1958.

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Origin of TENURE	1958 T S K[49]	No longer held in 1959 T S K[49]
From own family on his marriage in 1935...	5-5-5	4-3-8
From own family since his marriage	7-4-5	
From his bride's family at marriage	5-0	16-0-0
From non-relatives, all since 1955	28-0-3	
	42-3-3	20-3-8

OWNERSHIP of land held by Pawlu.		Plots		Plots
Church (Cathedral (Mdina).....	3-4-0	5	16-0-0	var
Church (Gharb.....	1-0-3	4		
Church (Benefizzju (agent).....	4-3-0	2		
Civil Government.....	3-5-0	2		
Other farmers.....	4-0-0	2		
Sinjur (a Xewkija Baron).....	5-0	1	1-1-8	2
Owned by Pawlu himself.....	4-0	1	1-0-0	1
Sub-leased (4-yearly) from 8 farmers who hold on long lease, or own.....	24-0-0	var.adj.		
Military authorities.....	0		0	
No information.....			3-0	1
Notary (agent).....			1-5-0	2
	42-3-3		20-3-8	

The details of the 20-3-8 relinquished by Pawlu are significant:

Sub-let because of small-size and inaccessibility.....	7-0
Sold because of inaccessibility.....	1-0-0
Abandoned because of distance & inaccessibility.....	1-0-0
Option declined because of distance.....	16-0-0
Exchanged.....	1-2-8
	20-3-8

*159
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427

On sixteen of his twenty-six plots of land Pawlu pays annually about £24 in rent. On average this works out at about 4 shillings per tomna for rough grazing land and £1.1.6d per tomna of cultivable dry (baghli) land. Pawlu himself receives an income of 5s 6½d per annum as rent for two small patches (totalling slightly more than a tomna) which he sub-lets. He himself owns the pivotal centre of his farm, and four sighan on which stands his house, cattle byre, coat shed, store rooms and small enclosures.

*159
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[246]

Pawlu's present policy is to expand fodder production in order to eliminate much of the very high cost of purchased fodder. Along with this he is keen to acquire the use of rough grazing land for his goats where he can do so cheaply. The large block of this type of rough grazing which Pawlu acquired piece-meal during 1957 and 1958 makes the supervision of the animals easier than would be the case if he had to graze them in small fields adjacent to land carrying standing crops. Pawlu is cutting down the quantity of vegetables produced for sale each year since he is without any guaranteed market or price. He aims nevertheless to produce as much of the family requirements as possible.

[244]

159 The trend is clear from an analysis of the utilisation of his land holdings-

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	1956			1957			1958		
	T	S	K[49]	T	S	K	T	S	K
House and adjacent roadway		2	0		2	0		2	0
Vines		3	0		3	0		3	0
Prickly Pear		3	0		3	0		3	0
Potatoes	2	0	0	2	0	0	2	0	0
Vegetables, other than potato(a)	6	4	0	4	3	0		4	0
Fodder(b)	8	2	3	10	3	3	14	2	3
Rough grazing - and shooting			0	12	0	0	24	0	0
Unused		1	0		1	0		1	0
	18	3	3	30	3	3	42	3	3

(a) mainly tomatoes and melons (bittieh and dulieh)
(b) silla, wheat (qamh), barley (xghir), mixed wheat and barley (mahlut), beans.

159 422 231 **Livestock** Pawlu's farm holding of slightly less than twelve acres is large by Gozitan standards. So also is the herd which it supports. Late in 1957 he had some 40 goats and 8 kids, two cows, a sheep, one horse, and about 100 poultry. "Goats are easier to handle than are cows" (Pawlu). For him, as for most herdsmen in the Islands, the dairy cow is still something of a novelty, and an expensive one, requiring considerable capital outlay for both the animal and its accommodation. The single sheep is quite typical, being kept mainly for the popular 'rikotta' cheese made from its milk. The large poultry element is also becoming a common feature in Gozo, though disease takes a very high toll. Pawlu's one horse provides the motive power for the cart which for him as for the rest of Gozo is still the prime mover of goods and produce.

159 234 434 Pawlu's income derives mainly from the sale of milk to the M.M.U. This was also the case before 1958 when Gozo finally became a 'closed' area in which unpasteurized milk could not, legally, be sold. Thus the herdsman's cry of "Halib, halib" ('Milk, milk') as he took his goats from door to door and milked them to order on the customer's threshold is heard no more. The churned milk from the farms is collected and taken to the factory at Xewkija - before 1958 it had had to make the long journey to the Hamrun centre. Apart from the unpasteurised fresh milk used by the family, Pawlu sells, and sold, the milk his goats produce to the M.M.U. He pays no labour, hired or family, and does not consider his own time as a cost factor. Some idea of his income is therefore obtainable from an account of his receipts from the M.M.U. against the costs of the fodder.

423 234 159 The amount of fodder bought in to supplement home production varies. In the case of sulla (silla), particularly, Pawlu is forced to buy in a large quantity when his own crop is poor. His purchases of wheat (qamh) and

*159 512 794 cafes, clubs, etc., it remains the centre of village affairs and the focus of activity, secular as well as religious.

Pawlu is one of the farmers of this village, but his 592 children are not likely to be farmers. Therefore can they 178 remain of the village? As yet it has patently little to *159 offer their education and culture and no apparent opportunity for a livelihood at their new and higher standards. They are leaving farming and are leaving the village as well in search of the means of earning a living - other than in farming.

SUMMARY of CASE I

*159 423 427 (A large scale Gozitan goats' milk producer with a considerable land holding)

A. Land.

●[311] - Area held in 1956: 18¾ tmien, 1957: 30½ tmien, 1958: 42½ tmien, the additions being almost entirely in the form of grazing land. The present holding is in 26 plots, rented from several landlords including Church, Civil Government and private individuals. Owns one small plot and sublets several others from neighbouring farmers. Plots scattered over considerable area in Gharb and St. Lawrens districts. Rent totals £23.14.0 p.a., ranging from 21/6 per tomna for cultivable (dry) land to 4/- per tomna for rough grazing.

- Previously held a further 20 tmien, 3 of which have been sub-let or exchanged and 17 abandoned owing to inaccessibility.

*159 423 311 B. Utilisation.

	1956	1957	1958
House	¼	¼	¼
Vines	¼	¼	¼
Prickly pear	¼	¼	¼
Fodders	8½	10½	14½
Vegetables	8½	6½	2½
Rough Grazing	-	12	24
Unused	¼	¼	¼
Total	18¾	30½	42½ tmien

*159 231 C. Livestock. (Nov. 1957)

38 goats, 8 kids
2 cows
1 sheep
100 poultry
1 horse

*159 401 [427] [456] D. Capital.

- Land all rented save one small plot.
- Appears to be amassing capital from profits on milk production.
- No specialised equipment.

*159 464 E. Labour.

- No permanent hired help.
- One son works full time on the farm, help from other children.

*159 433 [434] F. Production and Sales.

- Milk is the main item of income to which occasional small sales of vegetables are the only addition.
- Sample daily feed for 1 cow yielding c.3 gallons

*159 443 fluctuation. In such a situation he would find fixed annual repayments on loans for development much more difficult to meet.

SUMMARY OF CASE II

*159 (A goats milk producer with subsidiary cash-cropping).

A. Land.

[423] [427] Rents 10 separate plots, all dry land, in the Qwara Region.
Several landlords: total rent including house (£8.10.0) £35 p.a.

B. Utilisation.

[241] [311]
- Attention devoted mainly to fodders: wheat, barley, sulla.
- Grapes, some tomatoes and a few potatoes for sale.
- Various vegetables for home consumption.
- Grazing on waste and abandoned land.

C. Livestock.

[231]
- About 25 goats: 2 rams and 23 milkers all over 2 yrs. old.
- 20 hens, 5 pigs, 1 mule.

D. Capital.

[423] [454] [412] [409] [426] [427]
(i) No freehold land.
(ii) Little or no liquid reserve.
(iii) Equipment: usual hand implements; no mechanical equipment until 1957 when he bought a rotary cultivator at £350 with a government loan to be repaid at £62 p.a.
- Hires tractor and plow at 15 to 25/- per tomna.
- Borrows spray from brother.

E. Labour. (v. Table 4: Analysis of Work Record, 1957-58)

[464]
- No permanent hired labour.
- Help from wife and children (8 children, all below 14 yrs. of age, 4 at school).
- Employs a vine-grafter at 25/- a day when necessary (150 vines can be grafted in one day).
- Pays friends and relatives £1 daily for help at grape harvest.

F. Production and Sales.

[234] [43] [231]
(i) 22 goats (Nov. 1957) yield 3 gallons of milk daily which sells at 16/9 (5/7 per gall.).
- Keeps only milkers as no accommodation for rearing.
- Female kids sold for breeding fetch 7/- each, male kids sold to butchers when 15 days old fetch same price.
- Buys 3 to 5 goats annually to maintain herd - price in 1957 £10 each.
- 5 pigs includes 3 for meat, 2 for breeding; piglets weaned after 40 days and sold a week later.

[245] [434] [244]
(ii) Vine shoots bought from Govt. Farm at 28/- per 100.
Grapes sold to vintners. Price takes no account of quality.
- In 1957 sold 30 qantar at 44/- per qantar = £66.
- Tomatoes, small quantities sold, but bulk of crop made into paste for home use.

G. Husbandry.

[245] (i)
- Much effort expended on vines. Pruned in January, when 2 yr. old shoots cut back.
- Grafting in February; new grafts produce small crop the same year.
- Sprayed, plowed (3 or 4 times) in May.

* 159 443 484 521 Shopping is done in the local village but Marku makes the journey to Valletta for the 'Suq il-Hanti' Sunday market occasionally, though with the intention of gossipping rather than making purchases.

CASE III : Summary

(A goats' milk producer.)

* 159 423 **A. Land.**

30 Tmien in Haxxar-Gharghur Hills area.
14 Field plots in two main groups:
All on soils of tal-Dawl and l-Ikliin Complexes.
Of this - 5½ tmien freehold,
- 24½ tmien leased from 6 landlords.
Rents range between 10/- and £1 per tomna.

* 159 241 ●311 **B. Utilisation.**

Almost entirely fodder production e.g. February 1958
3 plots under widna.
1 plot under barley - pulled green.
3 half plots under wheat.
2 half plots under sulla.
1 plot used for goat grazing - fallow.
1 plot under forfir (bitter vetch).
1 enclosure under prickly pear.
3 plots under vetches.
[434] Remainder subdivided and carrying potatoes, broad beans and a few vegetables.
Only regular cash crop - winter potatoes.

* 159 231 **C. Livestock.**

During 1957/1958 goat numbers ranged from 35 to 50 and milkers from 27 to 40.
5 sheep kept for wool and sheeps milk for cheese-making.
1 mule - imported from Tunis.

* 159 [423] [454] [412] [407] **D. Capital.**

- Land held in freehold valued at £400 in early 50's
- Freehold village house.
- According to his own statement liquid reserves of £200.
- Equipment - hand tools, local wooden plows, etc. No machinery but plans to buy rotary cultivator.

* 159 464 **E. Labour.**

- Wife spends c.30% of her time on the land, although childrens ages range from 3-8.
- Communal help for threshing.
- Hires labour for barley and sulla cutting. During 1957 c.18 man days at cost of c.£15.
- [427] Every 4th year deep plowing (by contract) of about half the fields. Cost £1 to 15/- a tomna.
- Each year has some land tilled by rotary cultivator. Cost 12/- a tomna.

* 159 433 **F. Production and Sales.**

- Goats milk sales range from February minimum of c.45 lbs. per day to May-August maximum of c.70 lbs. per day.
- Winter potatoes as cash crop vary considerably in yield and in selling price.
- Occasional sales of small quantities wheat and wool.
- Produce consumed by family valued at c.£1 per week.

* 159 241 **G. Husbandry.**

(1) Land - All dung used on fields - usually before potato setting.
- 7-8 bags of sulphate of ammonia applied annually.
- The concentration on leguminous fodders prevents the employment of the normal four-year rotation.

159 423 - 10 field plots in single block of 4 tmien (Rent £2.10.0.), and
- 7 field plots in single block of 2 tmien (Rent £3).
- Grazing ground on Defence Dept., wasteland.

B. Utilisation.

159 241 311 (i) At any one time about half the land - that of the deep-soil terraces - will be under potatoes with a few vegetables, and the remainder under barley and leguminous fodder.

(ii) The arable land tends to be neglected as a result of pre-occupation with livestock. The land is therefore deteriorating and as soil wash reduces soil-depth and water availability, peas and vetches are replacing less hardy crops. The most accessible fields in this hilly region are worked mainly to meet domestic needs.

159 231 234 C. Livestock.

90 goats including 75 breeders and 2 billies.
7 sheep for meat and cheesemaking.
This herd built up in farmers lifetime (c.50 years).

D. Capital.

159 423 (i) No freehold land.

(ii) A freehold village house joint possession of farmer and brother-in-law.

511 426 (iii) Receives C.A.R.E. [27] food gifts but the family standard of living is by no means poor. No debts except on intra-family loan basis.

E. Labour.

159 464 (i) Of the family of 11, two children are employed elsewhere and the remainder give occasional help with the stock and on the fields.

(ii) The fields are inaccessible to powered tools. Hired labour for fieldwork - c.15-20 man days @ 24/- a day including mule and implements.

F. Production and Sales.

159 43 234 (i) Goats milk sales range from February minimum of c.100 lbs. per day to July maximum of 290 lbs. per day. Annual sales of the order of 6,400 galls. @ average price 5/9d per gallon.
Gross income from milk sales c.£1800.
No accurate record of expenditure on purchased feed but total can be estimated as of the order of £500 p.a.
Net income probably not more than £800 p.a.

(ii) Manure sold to arable farmers during first half of year with net profit of £18.

(iii) Home produced and consumed food and milk valued at c.10/- a day.

G. Husbandry.

159 23 (i) Livestock feeding of traditional pattern sulla, beans and cake is more carefully regulated in relation to yields than in Case III. Considerable emphasis placed on grazing and on stock exercising.

(ii) Herd suffers fairly severely from abortion and the kids from various diseases - 5 out of 16 in 1956, 4 out of 12 in 1957.
No prophylactic or remedial measures except more careful feeding. Sells sick and old stock for slaughtering.

(iii) Tries to extend period of maximum production by prolonging mating period but prefers to rely on "natural" periodicity rather than on producing off-season high yields. Has high standards for yields and has a good record in local shows for billies and breeders.

158 434 H. General.

An example of a high-class village goats-milk producer.

* H. General.

159 433 This farmer is typical of many herdsmen. Without capital or land he derives from previous generations of peripatetic herdsmen who milked their goats on the 'rounds' of urban houses. Now forced to sell his milk to a centralised agency (the N.M.U.) for pasteurisation he is protected from price decline during the summer season of over-production but prevented from obtaining extra profits and perquisites (often of rather a dubious character). Without capital he has to rely on credit terms for fodder purchases and therefore pays merchant prices which are higher than those of other farmers. A garden plot and the stock supplies about half the family's food, without which increment the family economy could not operate. There is no possible future except on a low level for this type of production.

* 159 231 232 CASE VI : Gaetu (A milk producer with a considerable land holding.)

In May, 1957, Gaetu had 9 cows and about 50 goats. During the year he sold some thirteen goats for the abattoir and of the eight kids born in the year several died "because they didn't want to go on living". In November of the same year three of his cows had to be killed, two of them on account of 'paralysis of the feet' (probably related to lack of exercise and perpetual stall-feeding). The goats get scarcely more grazing than the cows, being limited to the small yards adjoining the main farm building (v. Map 8).

The compulsory slaughter of the three ailing cows (for which he will be entitled to import replacements) has profoundly shaken Gaetu's faith in cows in general. He maintains that he "will put his efforts into goats for the loss of a goat means a loss of £10 against the £200 in the case of a cow."

* 159 234 [311] [246] [435] [464] Together with his adult son, Gaetu works 23 tmien of land, including some which is irrigable; and the emphasis in cropping is heavily on fodder production. But they still have to buy in a considerable amount of feed. For example in the 1956-57 winter Gaetu spent £175 on sulla, £99 for straw, and £15 on winter potatoes which were in glut. He feeds his animals according to yield which appears to mean that he gives more food and attention to the better yielding animals. "There is no profit in providing expensive fodder for poor-yielding animals." In fact, however, Gaetu has [451] very little appreciation of his profit. None of his labour or that of his son is counted as a cost and he keeps no detailed account of income and expenditure. He gets receipts from the N.M.U. but otherwise, being illiterate himself, feels "reluctant to ask anyone for a written [65] statement". Nevertheless he reckons to be able to put together some sort of balance sheet for the income-tax authorities each year.

6: Beeley · K-5 (1957-1958) 1959 EZ6 Malta EZ6

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342
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MAP. 8
FARMSTEAD
CASE VI

[following p. 102]

1 MAIN ENTRANCE ROOM
2 LIVING-ROOM/BEDROOM
3 WELL
4 WATER (TAP)
5 POULTRY
6 RABBITS
7 STEPS TO CELLAR USED FOR SHEEP
8 CARTS
9 GENERAL YARD

OTHER BUILDINGS

0 1 2 3 4 5 6 7 8 9 10
YARDS

159 For once a single man can be convinced of the success of a
829 novel method or crop he will soon be copied by his fellows.
178 Wenzu himself observes that when he had heard about the
246 lucerne for the first time and had planted some with great success in his own fields neighbouring farmers were not slow to copy him (v. Section 4).

CASE VII : Summary.

159 (A goats' and cows' milk producer with a small land holding.)

423 A. Land.
427 - Has 3 timon, worked by another farmer who shares income (£21) with him.
- Holds on lease a further area which had been let out for building and brings him £32 p.a. - much more than could be obtained for its crops.
- Also rents grazing in summer months.

159 B. Utilisation.
24 - The 3 timon field is under sulla, barley and a few vegetables.

C. Livestock.
159 - Is changing over from goats to cattle.
23 - Goats: 1954: 60; 1957: 44; 1958: 38.
234 - Cattle: 4 Friesians. Aims to build up the herd by private import of Ayrshires of which he has a high opinion. 3 of the cattle are owned by his sons though he tends them.

159 D. Capital.
454 - No information, but appears to have some reserves.

E. Labour.
464 - Some assistance from a son who is in govt. employment.
- Hires no labour.
- Thus does great bulk of the work himself.

F. Production and Sales.
434 - Milk (Oct. 1957) 10 gallons goats' milk, 9 gallons cows' milk daily to M.M.U. Gives sons a share in
234 income though they appear to make no payment to their father for fodder, stall accommodation etc.
- Calves and kids usually sold after weaning.

G. Husbandry.
159 (1) Grazing. Where possible, goats grazed out and this is
23 said to save him 15/- a day and to reduce sulla con-
429 sumption to 4 bundles daily.
- Rents 7 timon of govt. land from part-timers at £1
311 per month from Jun. to Aug.
- This land is good, cultivable land untended because of part-timers' inability to work it.

(2) Fodder.
- Cake, barley, potatoes, beans, sulla.
- Feeds all that the animals will take.
- Buys in bulk when prices low.
- In six months (Oct. 1957-Mar. 1958) used nearly ½ tons of cake and 15 tons of beans.
435 - Sulla is bought at 9/- to 16/- per hamel according to
434 quality and uses some 200 hmiel per annum.
- Fodder costs leave very small profit margin from milk.

H. General.
159 - Attempting to profit from sales to M.M.U. with no
156 knowledge of the economics involved.
- Extremely suspicious of agents, government etc.

159 Their failure to profit contrasts with the success of the
829 Gozitan milk producer, Case I.
231 The partnership's main aim is to accumulate cattle with-
(433) in the current artificial economy of milk production. There is no thought or care for what might happen if the subsidy were removed or even reduced.

CASE X : Ġamri (An arable farmer in partnership with a brother and engaged in diversified production.)

159 Ġamri is an arable farmer, specialising in fruit. He
241 has a couple of goats and sheep, a mule, and is keen to
231 acquire more pigs for fattening. Most of his effort is how-
427 ever centred on the land holding which he and his brother work
472 in partnership. Some fifty-three tmien are rented by the two brothers together while Ġamri himself rents a further ten tmien. About two-thirds of the land (17 plots) is owned by private landlords, one sixth belongs to the Church, one tenth to the Government and the remainder - about an acre - is owned by Ġamri's father.

159 The working partnership of the two brothers is of many
472 years' standing. The brother's eldest son now works full-
464 time alongside the two men. The brothers say they could not
241 cope with any more land than they are working at present. They share the common view that hired farm labour is both uneconomic (at 25s or more for an eight-hour day) and inefficient. The land worked by the partnership is dry (bagħli) apart from two irrigable (saqwi) tmien. In 1957 it was utilized as follows:

(311)

Fruit and vines	21 tmien
Cereals and fodders	18 tmien
Fallow, unproductive, or sub-let	13 tmien
Potatoes	6 tmien
Other vegetables	5 tmien

159 Apples are the biggest single cash crop and the overall
245 success of any year depends on them. They were introduced
242 to the district by Ġamri's father some years ago and now grow in large numbers in a sheltered valley along with lemons, oranges, mulberries, figs, cherry-plums and other fruits. The produce is good but is usually affected by some pest or disease. The most prevalent of these is a boring grub. Ġamri and his brother spend a large part of September and October simply gouging this pest from the trunks of affected trees - with penknife and piece of wire. They regard this time-consuming and unremunerative task fatalistically. But of late Ġamri has been wondering whether the same result might not be achieved in a fraction of the time by the application of some spray. He knows nothing of the details of this and is more than a little doubtful of possibilities.

159 Since 1953 Ġamri and his brother have expanded their
245 area under vines, buying seedlings from the Government Farm
(435) at 1d each. They consider vines the most profitable of crops, especially grapes for wine since these can be picked

*159 241 311 The larger pieces of ground are put to potatoes, tomatoes, artichokes (qaqoċċ), marrows (qargha baghli), and a variety of vegetables. Fig, pomegranate and other trees fill the corners and edges of fields and a tomato seed-bed and a hen-house also manage to find space in odd corners. Two machine-driven pumps and a few tiny storage and shelter rooms complete the scene. The block of fields is in a small sheltered valley on the east coast of the Island and contains clay soils tending to be heavy, especially in wet weather.

[406] [343] [134]

*159 241 433 434 829 [464] Pietru's irrigable fields are clearly the focus of his interest and attention. He observes that they bring in a greater profit per man/day of effort than do the dry fields which he prefers to leave to the wife and children to cultivate on a more casual basis. Nevertheless Pietru is not able to make a profitable concern of his farm despite his own heavy working schedule and the full-time assistance of at least two teenage children. In fact he is poor enough to qualify for C.A.R.E.[27] food distributions. He is however content with farming as an occupation and critical only of the lack of adequate remuneration. His attitutde is to 'make the most' of his farm within current limitations. He was a founder member of a C.A.R.E. sponsored tractor co-operative (Section 2) although he admits that when the project was first suggested he was opposed to it on the grounds of rather having the money than letting the Government get it. This belief that the Government is behind everything is characteristic (Section 4). C.A.R.E. is of course an independent organization distributing American surplus food and equipment.

[474]

*159 178 241 Thus Pietru's son who works full-time with his father is faced with his father's industry and enthusiasm for farming on the one hand but he can see for himself the apparent impossibility of achieving anything above low living standards. Whether he will join the trek away from farming is not yet clear. His educational standard is lower than is the case among many of his generation and it may be that he will have difficulty in finding employment outside farming.

If Pietru can improve the efficiency and profitabily of his farm (by using better suited crops, new methods and new equipment with Government financial and advisory assistance) his son might be pursuaded to stay in it. The problem of Maltese farming today is that there are very few young men in the farming industry who show as much inclination to stay on the land. The Government has been keen to assist the full-time farmer with loans and other help in an effort to encourage him to stay on the land and to develop agriculture to the full but it has done comparatively little for the young men in farming who are, in the long term view at least, the more important. If they cannot be induced to stay in farming the industry would appear to be doomed.

[426] [654]

9: Luke G-5 (ca. 1920-ca. 1960) 1960
EZ6 Malta EZ6

CHAPTER XVII

Casals and Countryside

OWING TO THE DENSITY AND RAPID GROWTH OF THE population, to the lack of soil and to the abundance of excellent building-stone, which not only takes on in the course of ages a beautiful patina but is easy to work, the proportion of Malta's built-up area to the area under cultivation is probably uniquely high. Unique is probably also the "Red Soil Law" whereby anyone about to erect a house is compelled to dig up and hand over to the Government (which removes it for him) any soil there may be on the site of the future structure, so that the precious earth may not be buried and lost for ever to the island's cultivators. So precious is it that the smallest pockets, however inaccessibly they may be situated, are jealously conserved. Malta is low-lying—in the words of Tasso

giace Malta fra l'onde occulta, e bassa

—and only on the thyme-covered cliffs of the south-western stretch of coast does it rise as high as 800 feet. These cliffs are wild and rugged and sheer, but here and there, as they drop precipitously to the sea, narrow ledges of earth-covered rock cling precariously to their face. But even these *redums*, as they are termed—the like of which I have seen only on that hermit-inhabited spur of Mount Athos which is called Kerasia—are brought into use by the indomitable Maltese farmer of the locality, who sometimes lives in the caves beside them with his family and his animals as his Stone Age predecessor lived in them before him.

Thus every nook and cranny of these islands is eloquent of their past: towns; casals; little country chapels, farmhouses and isolated gateways, which are often adorned with

9: Luke G-5 (ca. 1920-ca. 1960) 1960
EZ6 Malta EZ6

some sculptured escutcheon; the old stone *fougasses*[1] to be encountered along the coast; even the very cliffs, even tiny Comino, from whose stony fields, where is cultivated the cumin seed from which the island takes its name, there rises one of the massive square keeps which the Knights scattered throughout their territory.[2]

The casals are, as has been said in an earlier chapter, not villages, but compact stone townships of tall houses and narrow streets, solidly built in good substantial Baroque architecture. Their outskirts, as likely as not, are dignified with some ancient country-house concealed behind high walls amid charming gardens—the beauty and seclusion of the Maltese gardens are justly proverbial—while the focus of the casal, both literally and metaphorically, is the parish church. This is generally a great Baroque pile of golden sandstone flanked by two massive towers, but an exception is the Parish Church of Mosta, built in the classical style in the middle of the nineteenth century mainly by the efforts, both technical and financial, of the villagers themselves to the design of the ingenious Maltese architect Grognet de Vassé mentioned in Chapter II. It is topped by a dome that claims to be the third largest in the world, being surpassed in size only by those of S. Sophia in Constantinople and S. Peter's in Rome, higher internally than the dome of the Roman Pantheon and exceeding by sixteen feet the diameter of that of S. Paul's in London.

[1] Patrick Brydone (*cf.* pp. 143–147) gives an interesting account of this little-known form of coastal defence; "For we found, to our no small amazement, that the rocks were not only cut into fortifications but likewise into artillery to defend these fortifications: being hollowed out in many places into the form of immense mortars. The charge is said to be about a barrel of gunpowder, over which they place a large piece of wood, made exactly to fit the mouth of the chamber. On this they heap a great quantity of cannon balls, shells, or other deadly materials; and when an enemy's ship approaches the harbour, they fire the whole into the air: and they pretend it produces a very great effect, making a shower for two or three hundred yards round that would sink any vessel."

[2] An excellent companion for the exploration of the island is F. Weston's *Walks in Malta*, published in Valetta. Later booklets include Showell Styles, *Walks and Climbs in Malta* (Valetta, 2nd edn., 1952), and H. H. Hick, *Walks in Gozo* (Malta, 1953).